S
636.1
W5e
1975

PLEASE RETURN

An Evaluation of the Recreation and Interpretive Potential of the Pryor Mountain Wild Horse Range

by: Mark Rey

Bureau of Land Management – Montana

STATE DOCUMENTS COLLECTION
MAY 24 1978
MONTANA STATE LIBRARY
930 E Lyndale Ave.
Helena, Montana 59601

Resources Development Internship Program
Western Interstate Commission for Higher Education

Montana State Library
3 0864 1006 8757 6

This report has been catalogued by the WICHE Library as follows:

Rey, Mark
An evaluation of the recreation and interpretive potential of the Pryor Mountain Wild Horse Range / by Mark Rey. -- Boulder, CO : Western Interstate Commission for Higher Education, 1975.
59p.

1. Pryor Mountain Wild Horse Range, MT.
2. Montana - Recreation. I. U. S. Bureau of Land Management. II. Western Interstate Commission for Higher Education. Resources Development Internship Program. III. Title.

The ideas and opinions expressed in this report are those of the author. They do not necessarily reflect the views of the WICHE Commissioners or WICHE staff.

The Resources Development Internship Program has been financed during 1975 by grants from the Economic Development Administration, the Jessie Smith Noyes Foundation, the National Endowment for the Humanities, the Wyoming Office of Manpower Planning; and by more than one hundred and fifty community agencies throughout the West.

WICHE is an Equal Opportunity Employer.

AN EVALUATION OF THE RECREATION AND INTERPRETIVE POTENTIAL OF THE PRYOR MOUNTAIN WILD HORSE RANGE

Mark Rey
Billings District Office
Bureau of Land Management
Billings, Montana
September 2, 1975

OCT 2 4 1984

TABLE OF CONTENTS

Table of Contents i

Abstract ii

Acknowledgments iii

I Introduction and General Description of the Study Area 1

II Basic Herd Data 4

III Alternatives for Management and Their Interpretive Bases 10

IV Traffic Counter Analysis 18

V Lovell Tourist Questionnaire Analysis 22

VI Wild Horse Questionnaire Analysis 25

VII Interpretive Philosophy and Analysis of Potential Interpretive Sites 31

VIII Recommendations and Executive Summary 37

Literature Cited 40

Appendices (1-5) 46

ABSTRACT

The purpose of this report is to identify relevant parameters in wild horse biology and behavior and recreation user behavior in order to facilitate the development of an interpretive and recreation plan for the Pryor Mountain Wild Horse Range.

A detailed literature search was undertaken in the areas of wild horse and related species biology, recreation area wildlife management, methods for wildlife interpretation, and recreation user behavior. Pertinent publications are cited in the body of the report.

Basic biological data were collected on the wild horse population. These included a population inventory, movement patterns, and areas of concentration on the range. This information was used in evaluating various management alternatives and potential sites for interpretation of wild horses.

A set of tourist questionnaires was administered in Lovell, Wyoming to determine tourist motivations for passing through the area. Another set of recreation and attitude questionnaires was administered to recreation users in the Pryor Mountain Complex (Bighorn National Recreation Area, Pryor Mountain Wild Horse Range, Custer National Forest). Demographic data, motivational data, and preferences for interpretation and development of the horse range were collected in these questionnaires.

The above sets of data are correlated and management alternatives and their corresponding interpretive emphases are evaluated. Relevant elements of visitor motivation and preferences are discussed. Finally, specific recommendations are provided for management of horses and recreation users, and for interpretation of the horse range.

ACKNOWLEDGEMENTS

I would like to extend my appreciation to Robert Hullinghorst and the Western Interstate Commission for Higher Education for my selection as a "WICHE" intern to engage in this project. Similar thanks are extended to the Bureau of Land Management Billings District staff for their assistance during the study. I am particularly indebted to my project supervisor, Lowell "Bud" Brown and to Keith Thurlkill for their help and guidance during the planning stages of the study. Various personnel of the U. S. Forest Service and the National Park Service also contributed ideas and assistance.

I am indebted to Royce and Marian Tillett of Lovell, Wyoming for allowing me to live on their land during the course of the study. I would also like to thank Robert and David Hunter for field assistance in administering recreation questionnaires and watching horses. Finally, I would like to convey my gratitude to Francesca Cary for help in compiling data and for lending her considerable photographic skills to the completion of this project.

Digitized by the Internet Archive
in 2018 with funding from
Montana State Library

https://archive.org/details/evaluationofrecr1975reym

INTRODUCTION AND GENERAL DESCRIPTION OF THE STUDY AREA

This study is designed to provide the Bureau of Land Management with information on management alternatives, a conceptual interpretive base, and specific recommendations for interpretation, management and development of the Pryor Mountain Wild Horse Range. A variety of data types were collected and analyzed. The design, methodology, and evaluation of each is included in the appropriate sections of this report. The specific recommendations at the end of the report flow from the data and are designed to serve as an executive or concise summary of the report.

The Pryor Mountain Wild Horse Range is located on the Montana-Wyoming border in the Bighorn Mountains, of which the Pryor Mountains are a part. The range is located approximately 10 air miles north of Lovell, Wyoming. The horse range (Fig. 1) includes approximately 3,600 acres in Bighorn County, Wyoming and 30,000 acres in Carbon County, Montana. The range is bounded on the east by the Bighorn Canyon and on the west by Crooked Creek Canyon. Where natural barriers do not exist, the horses are confined to the range by barbed wire fencing. Through an agreement with the U. S. Forest Service, horses are now allowed the use of parts of Custer National Forest.

The horse range varies in elevation from 3,650 feet to 8,800 feet above sea level, with slopes ranging from 3 to 90 percent. Elevation gradients divide the Pryors and the horse range into five environmental zones. The alpine zone, consisting mainly of open, alpine meadows, ranges from 8,000 feet to 8,800 feet above sea level. Steep-sided canyons, caves, and timber covered ridges characterize the limestone rockland zone between 6,000 feet and 8,000 feet above sea level. Lower slopes make up the sandstone cuesta zone at 5,400 feet to 6,000 feet above sea level. The grassland zone from 4,600 feet to 5,400 feet above sea level is made up of rolling sage brush prairies. Finally, the lowest zone, the dry land zone, extends from 3,500 feet to 4,600 feet above sea level. This zone consists of vast expanses of open country devoid of dense vegetation. In certain areas microclimate and zootic variables disrupt, or add complexity to, this general pattern.

A detailed description of the Pryors ecosystem will not be provided here. Attention is drawn to BLM (1968) for a detailed description of the area's soils; to Blackstone (1936; 1940) for a detailed analysis of the geology of the Pryors; and to Despain (1973) for a comprehensive treatment of the vegetation patterns in the area. BLM (1971) provides a list of the most commonly observed animals in the horse range area.

The archeology or pre-history of the Pryors-Bighorn Canyon area has been investigated and reported by Loendorf (1969A; 1969B; 1970), Brown (1968) and Husted (1969). The history of the general area since the late nineteenth century is discussed by Harvey (1974). In addition, the controversy and history behind the establishment of the Pryor Mountain Wild Horse Range is detailed by Ryden (1970) and Harvey (1974).

For administrative and recreation development purposes, the Pryor Mountain Wild Horse Range is considered a part of the Pryor Mountain Complex (Fig. 2). Travel in the interior of the horse range is presently limited (by road conditions) to four wheel drive vehicles or vehicles with high clearance axles.

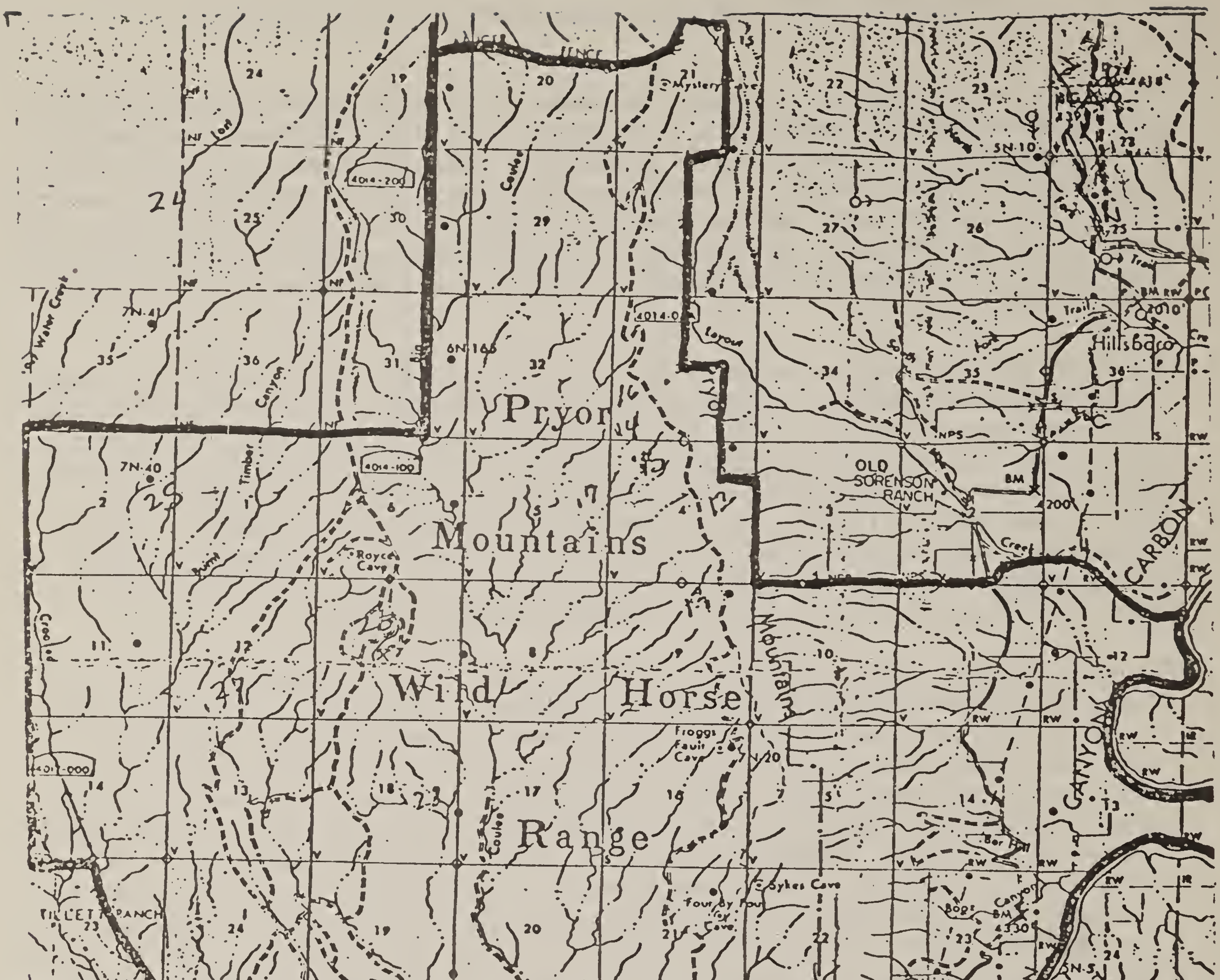


FIGURE #1 PRYOR MOUNTAIN WILD HORSE RANGE

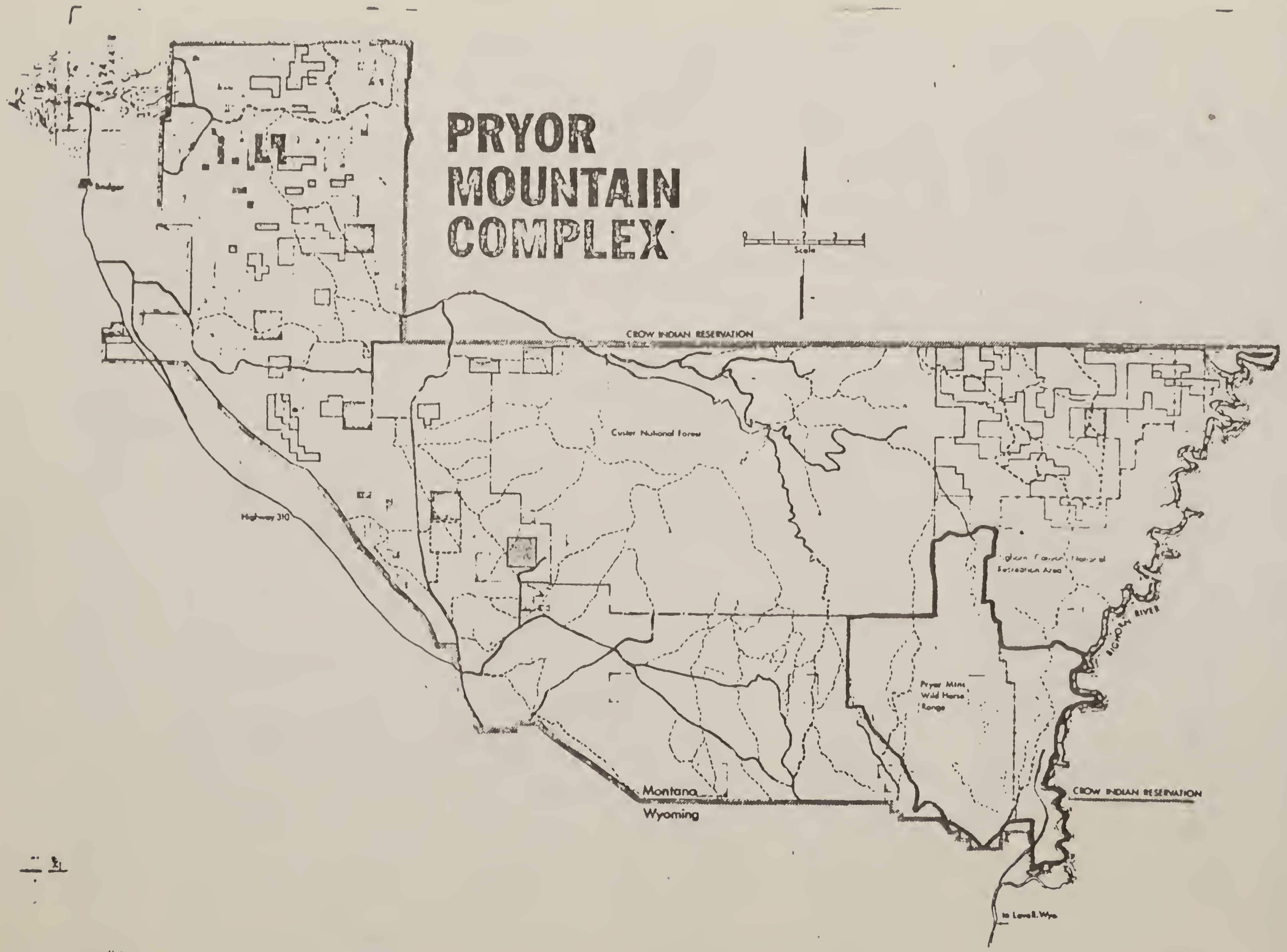


FIGURE #2 PRYOR MOUNTAIN COMPLEX

BASIC HERD DATA

A few specific types of herd data were collected to aid in describing management alternatives and in developing an interpretive plan. These data were obtained through direct observation of the Pryor's herd.

When a band of horses was first sighted, the color makings for each member were recorded on prepared sheets containing silhouettes of right and left sides and the head and chest. The date, location and time of day were noted along with the sex and age of each band member. Individuals were classified by age as foal, yearling, immature (two or three years old), or adult. The distinction between immature and adult animals was difficult to draw in many cases. Locations of sightings were recorded using maps with mile-square grids. Each animal was given an individual number and a band letter. Individuals were grouped into bands and each time a band was sighted, data were recorded for each band member.

Travel on the horse range was by half ton truck. Horse range roads (Sykes Ridge, Tillett Ridge, Transpark) were driven at least twice each week and sightings of horses were recorded. In many cases, the usual procedure was to drive to some particular part of the range and then work on foot. Observations and identifications were made using 10 x 50 and 8 x 50 binoculars.

The total number of sightings was plotted in a cumulative fashion (Fig. 3). This was done to identify areas of horse concentration as an aid to possible interpretative design. Figure one shows three major and one minor areas of concentration of horses during the summer, or high recreation use months. Utilization of these areas will be discussed further in a later chapter dealing with interpretive design.

A sex and age table (Table 1) and a table of individual colors (Table 2) were compiled for the 128 animals sighted. The 26 animals removed from the herd as a result of the spring 1975 roundup were added to these tables to obtain a near total herd population. A few bands ranging in the National Forest, northwest of the horse range remain unsighted. This amounts to approximately ten animals.

Table one shows the total age structure of the herd, the sex ratio of the herd, and the sex ratio of each age class. The reproductive rate of the herd was calculated to be 20.02 foals per 100 mares. Feist (1971) noted a reproductive rate of 43.2 foals per 100 mares during his study on the Pryor's horses in the summer of 1970. The low reproductive rate this year is, as of yet, not fully explained. A severe spring and poor weather during the foaling season are presently, and most logically, the attributed causes.

The average band size for the Pryor's horses is 3.66 animals per band. This compares with 5.0 animals per band in the summer of 1970 (Feist, 1971).

The sex ratio of the herd appears to be 40 males to 60 females. The sex ratios of the younger age classes are more severely skewed, but small sample size makes these data questionable in regard to interpretations that can be drawn.

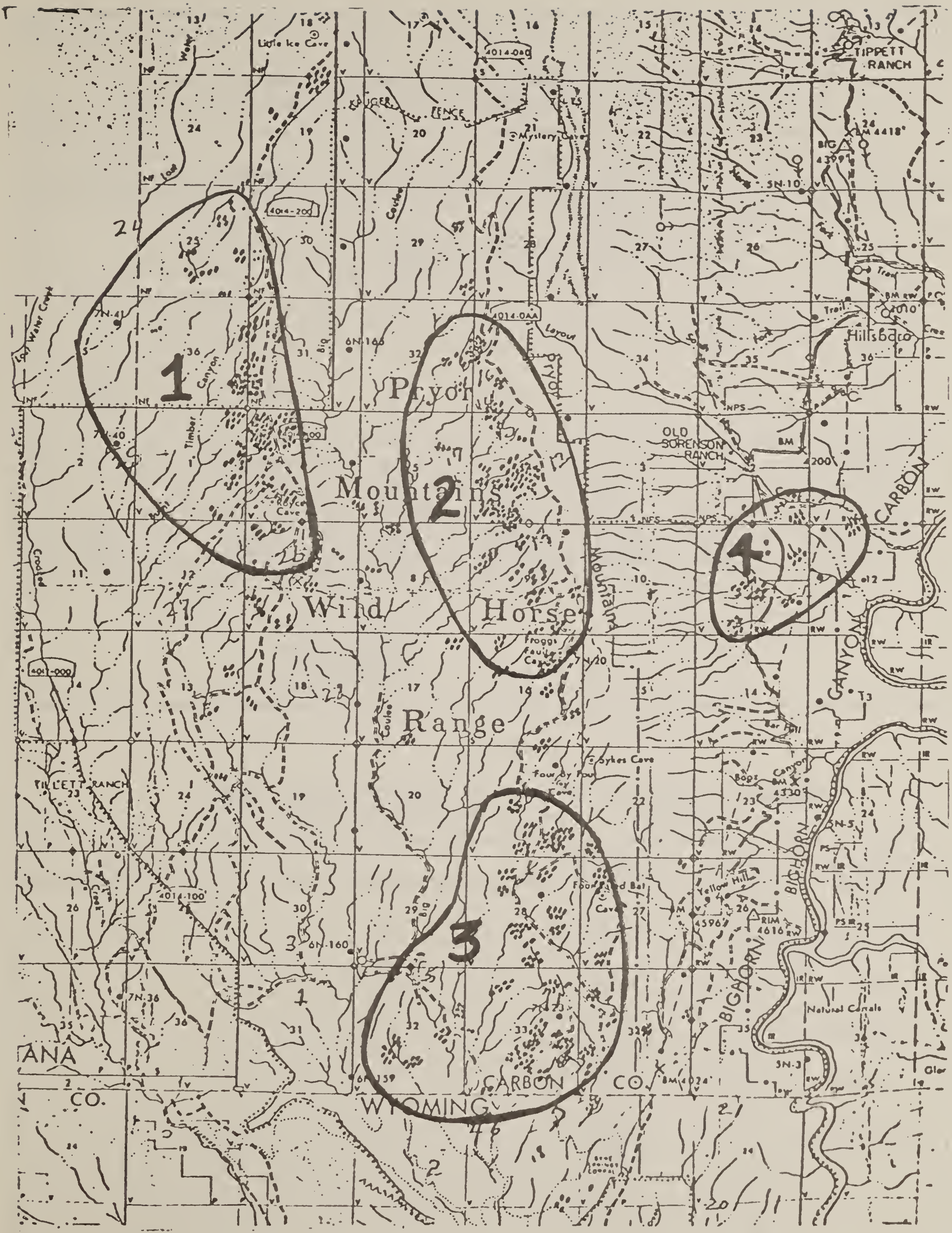


FIGURE #3 AREAS OF WILD HORSE CONCENTRATIONS

TABLE #1

SUMMARY OF SEX AND AGE COMPOSITION OF PRYOR MOUNTAIN HORSES
(Includes 22 Horses Excessed in 1975)

	AGE CLASS				TOTAL	PERCENT
	Mature	Immature (2-3yrs)	Yearling	Foal		
Male	45	5	4	8	62	40.3
Female	65	8	14	5	92	59.7
Total	110	13	18	13	154	100.0
Percent of Total Population	71.4	8.4	11.8	8.4	100	
Sex Ratio	69.2 100.0	62.5 100.0	28.6 100.0	160 100	67.4 100.0	Male Female

Average Band Size
3.66

Reprod. Rate
$\frac{\text{20.02 Foals}}{\text{100.00 Mares}}$

TABLE #2

SUMMARY OF COLOR COMPOSITION OF PRYOR MOUNTAIN HORSES
(Includes 22 Horses Excessed in 1975)

COLORS	NUMBER
Black	46
Bay and Brown	62
Sorrel	13
Blue Roan	4
Grulla	5
Buckskin	24

The herd consists predominantly of bays, blacks and browns. During the observation period it was noted that the horses on upper Tillett Ridge (Fig. 1) are all bays or blacks. Since these horses both summer and winter on Tillett Ridge, and are separated from the rest of the herd by Big Coulee (Fig. 1), their degree of interaction with the remainder of the herd is questionable. The differences in color patterns give credence although not absolute proof to the suggestion that the Tillett Ridge horses are, for all practical purposes, a separate breeding population of 38 horses. Feist (1971) noted that the extreme southern end of the horse range was the only opportunity the horses had for east-west movement. This was noted before National Forest lands on top of the mountain were made available to the horses. However, the amount of interaction between the two sub-herds is still questionable. For the purposes of comparison, a sex, age and colors table is provided for each of the two sub-herds (Tables 3 and 4). Data are insufficient for definitive conclusions, however.

As lands are added to the southwest of the horse range by exchange they should remain in an unfenced state (with only an outside boundary fence) in order to facilitate and encourage east-west horse movement and subsequent interaction between Tillett Ridge and Sykes Ridge horses. This will be beneficial to the gene pool of the whole herd. Other interpretations of the data will be made in appropriate places throughout the remainder of this manuscript. Collection of on-the-ground data such as these should be performed on an annual basis due to the subtle biases in aerial survey data (Caughley, 1974).

TABLE #3

SUMMARY OF SEX, AGE AND COLOR COMPOSITION OF HORSES
PRESENTLY OCCUPYING UPPER TILLETT RIDGE

	AGE CLASS				TOTAL	PERCENT
	Mature	Immature (2-3yrs)	Yearling	Foal		
Male	10	1	0	1	12	31.6
Female	20	1	3	2	26	68.4
Total	30	2	3	3	38	100.0
Percent of Total Population	78.9	5.3	7.9	7.9	100	
Sex Ratio	$\frac{50}{100}$	$\frac{100}{100}$	---	$\frac{50}{100}$	$\frac{\text{Male}}{\text{Female}}$	

COLORS	NUMBER
Black	7
Bay or Brown	28
Buckskin	3 - actually consists of a single band on Lower Tillett Ridge

Average Band Size	Reprod. Rate
3.8	$\frac{15 \text{ Foals}}{100 \text{ Mares}}$

TABLE #4

SUMMARY OF SEX, AGE AND COLOR COMPOSITION OF HORSES PRESENTLY OCCUPYING SYKES RIDGE AND TRANSPARK ROAD AREAS

	AGE CLASS				TOTAL	PERCENT
	Mature	Immature (2-3yrs)	Yearling	Foal		
Male	25	2	1	7	35	38.9
Female	45	4	3	3	55	61.1
Total	70	6	4	10	90	100.0
Percent of Total Population				100		
Sex Ratio	55.6 / 100	50 / 100	33.3 / 100	233.3 / 100.0		Male / Female

COLORS	NUMBER
Black	35
Bay or Brown	16
Sorrel	10
Blue Roan	4
Grulla	5
Buckskin	19

Average Band Size	Reprod. Rate
3.6	22.2 Foals / 100 Mares

ALTERNATIVE FOR MANAGEMENT AND THEIR INTERPRETIVE BASES

Although this study deals mainly with recreation management, alternative forms of horse management are presented here to acquaint the reader with various options and their limitations. In addition, in a multiple use agency, recreation and, subsequently, interpretation are only two of a variety of uses for a given resource. However, in the course of the recreation experience, the user is often exposed to the activities and/or results of other resource uses. As a result, the interpretive plan must be intimately linked to the overall management plan in order to explain the interaction or trade-off between resource uses to the recreating public.

Care should be taken to insure that the interpretive plan correctly states the goals and results of the management plan. In this sense interpretation can be viewed as a form of public relations. The following discussion will outline two very different, yet equally justified, approaches to management of the Pryors horse herd. Each management plan will then be linked with an interpretive philosophy or set of emphases that will explain the goals of the management plan to the visiting public.

One alternative for horse management has been termed the "natural ecosystems" form of wild animal population management. This management concept is applicable when the primary value of the wildlife population in question is aesthetic rather than utilitarian. The primary area of application of this management philosophy has been in the Rocky Mountain National Parks (Yellowstone, Glacier, Grand Teton) with respect to resident park ungulate populations.

The assumption behind this management philosophy is that natural ecosystems possess a series of regulatory checks and balances that insure a dynamic (read, fluctuating) stability. This system will provide a viable means of fauna control without outside interference (Cole, 1969; Houston, 1971).

This system of natural (although not always mild) regulation of animal populations evolved from the implications of the mission oriented research carried on by park biologists on animal populations in Yellowstone, Grand Teton and Glacier National Parks. The management plan is based upon the recognition of compensatory mechanisms in unregulated animal populations. The implication of such compensatory action is that, once the mortality rate increases, competition for resources will decrease and result in an increased birth rate. This will take place before a state is reached in which an extremely low number of reproductive individuals is left in the population. Unregulated animal populations have a latent potential for high natality which allows a compensation for periodic increases in mortality (Cole, 1971). The elucidation of these types of population mechanisms have their analytical base in the Park Service research on elk (Cole, 1967; 1971; 1972), moose (Houston, 1968), bison (Meagher, 1973) and bears (Cowan et al, 1974). A study of a naturally regulated bighorn sheep population (Woodgerd, 1962) demonstrated similar results.

In a physiological and more specific sense, fetal absorptions (Allen, 1968) and, in some cases, fetal competition (O'Gara, 1969) can cause low natality rates during periods of high population density or low range quality. Higher winter mortality during periods of high population density, low range quality, or inclement and severe winter conditions has been demonstrated as a common compensatory mechanism (Verme, 1971).

The overall implication of "natural ecosystems" management is that low rates of increase in some wildlife populations and periodic high overwinter mortality are not unnatural phenomena (Cole, 1971). Further, the observation of these phenomena in animal populations is not prima facie evidence that the population is about to graze itself out of existence in a mighty crash. Also implicit in this system is the realization that many areas (especially areas where animals concentrate) will appear overgrazed in the usual or technical sense of the word. It follows that the criteria used in forestry or range and wildlife management, where vegetation and wildlife are harvested as a crop, do not necessarily apply to areas which seek to maintain primarily aesthetic, natural, or at least different, values (Houston, 1971). Even though technical resource uses and values may be lost, a significant advantage can be reaped by using the "natural ecosystems" concept as an interpretive vehicle (Houston, 1971).

This potential use for natural ecological relationships as an educational tool is corroborated by Forest Service researchers. Hendee (1969) suggests that the opportunity to increase the intangible benefits of outdoor recreation by stimulating understanding through interpretation of the ecosystem is much greater than is generally realized. Indeed, interpretation and enhancement of the public's fascination with the environment may well be the most underutilized of all wildland benefits (Wagar, 1968). The implication of "natural ecosystems" management for wildlife managers and interpreters alike is that, through proper interpretation, the general public can be educated to accept the actions of natural regulatory mechanisms working on animal populations. Cole's (1975) information paper dealing with Park Service ungulate policy illustrates this principle well.

Since the value of the Pryors horses is primarily, if not entirely aesthetic, "natural ecosystems" management is one management alternative that could be applied to the Pryor Mountain Wild Horse Range. Elsewhere (Hall, 1972) it has been suggested that because the system works only with animals that have evolved with their ecosystem, it is inapplicable to wild horses. Horses are biologically classed as exotic species and cannot be considered as such animals. However, even a conservative estimate suggests that horses have occupied the Pryors for at least 100 years (Hall, 1972). Other estimates suggest a 200-year occupation (Ryden, 1970). One hundred years is equivalent to at least seven or eight generations of horses. If the horses are expected to expand rapidly to exploit a new niche it seems likely that they would have done so by now. Riney (1964) demonstrated that introduced populations of large herbivores, if undisturbed, follow a pattern of adjustment to a new environment which consists of a single eruptive oscillation. After this initial oscillation, the growth rate resembles that of a native animal population. Very likely the horses expanded rapidly (given a fairly low intrinsic rate of increase), fell long ago, and returned to a system of fluctuating equilibrium analogous to populations of similar, but native ungulates.

Hall (1972) also suggests that the Pryors herd needs to be regulated due to an unhealthy population age structure. Much of this analysis is based upon a life table of the Pryors herd taken at a single point in time by a population sample of the herd. Hall notes a low reproductive rate in two consecutive years and indicates that, if this continues for three or four years, the population will eventually have an extremely low proportion of individuals in the reproductive age classes when the young of these low reproductive years enter the reproductive age classes. This will result in a situation where the entire span of the reproductive years will be passed without productive animals on the range (Hall, 1972). Hall is, for all practical purposes, suggesting that low reproductive rates will lead to extinction or near extinction.

This conclusion is disputed by studies on the wild ponies of Sable Island off Canada's Atlantic Coast. These horse populations are not artifically regulated, yet the mares foal, on the average, only about every third year (Bruemmer, 1967). Hall also ignores the latent potential for high natality which allows populations to compensate for periodic increases in mortality (Cole, 1971). Little consideration is given to compensatory mechanisms operating in the horse population.

Hall also suggests that an unregulated horse herd results in changed behavior patterns among the horses. A study of wild and free-roaming horses in western Nevada (Pellegrini, 1971) is used to support the contention that wild horses are naturally territorial. However, more definitive studies have indicated that, among wild Equids, plains and mountain zebras are not territorial (Klingel, 1965). To date, the Grevy's zebra (Klingel, 1969) is the only Equid in which territoriality has been demonstrated. In a discussion of the social organizations of various species of Equids, Klingel (1972) indicates that territoriality is present only in Equid species without a stable harem structure. More exhaustive observations of wild and semi-wild horses have indicated that they are not territorial (Feist, 1971; Tyler, 1972). Feists' study is particularly relevant because it was done on the Pryors herd and because it showed considerable overlap of bands clearly indicating a lack of territorial behavior (Feist, 1971). The concept of intraspecific territoriality is associated with distinct territorial boundaries, the active defense of these boundaries, the exclusion of non-band conspecifics from the territory (Kendeigh, 1947; MacArthur, 1958), and far less uncontested overlap of bands than Feist observed in his study.

Hall goes on to suggest that, even though wild horses are normally territorial, the Pryors horses are not territorial because, "In the extremely congested situation that the horses have had there at least for the last several years, it appears that the horses have not been able to express their biotic potential. They have not been able to express their desire to establish a territory. There is simply not enough living space for the horses. There is not enough vegetation within a particular area that can be defended and utilized by one specific band of horses. All animals require a certain amount of living space. At this time in the Pryors, it appears that the horses do not have the area available to them that is necessary for the establishment of territories ... The horse is no different than many other animals. When he is starving to death, many behavioral traits will be abandoned" (Hall, 1972).

Hall's association of biotic potential with the expression of territoriality is diametrically opposed to the results expected from an examination of intraspecific competition. MacArthur (1958) indicates that territory size does not condense (let alone disappear) even in fairly dense populations. He suggests further that extremely dense populations might shrink territory size although no evidnece of this has been produced. In such a case, territorial expression and defense should intensify rather than disappear as Hall suggests. The behavioral traits that Hall indicates the horses are abandoning are precisely those traits that they should most strongly retain if the herd is, in fact, too dense.

The association of lack of territorial expression and crowding should be easy to verify or disprove. If Hall is correct, territorial expression should now be more obvious in the Pryor's herd than it was in 1971 when Feist studied a population of 225 horses. However, a mapping of individual sightings of four bands on Sykes Ridge (Fig. 4) and six bands on Tillett Ridge (Fig. 5) still shows considerable overlap of home ranges even with an estimated population of only 130 animals. In addition, a graph of the daily movement patterns of four closely spaced lands on Tillett Ridge (Fig. 6) shows a similar amount of overlap in range use as the same type of graph constructed by Feist (1971, p. 85). The implication of these data is that the Pryors horses are still not territorial. The preponderance of research indicates that free-roaming wild horses are not territorial.

The overall implication of the above analysis suggests that "natural ecosystems" management could be applied to the horse range in a biologically sound fashion. The corresponding interpretive emphasis would be similar to the interpretive program at Yellowstone where natural processes (including large die-offs during severe winters) are explained to the public as natural occurrences. Quite simply, the interpretive message says that, "Mother Nature does take care of her own", but not in the way that most people think. Many animals may perish in a winter die-off but the population will survive. In this case, the interpretive program acts as an educational buffer between the public and the shock of seeing many animals in poor condition. The Park Service has been using fairly sophisticated ecological concepts as an interpretive vehicle for communicating an understanding of their program of natural regulation of ungulates in national parks (Houston, 1971).

Looking past the basic biological parameter of "natural ecosystems" management, several significant disadvantages develop in its application to the horse range. Even though the "natural ecosystems" management philosophy is biologically sound, it must be viewed in terms of the mission of the agency wishing to employ it. The primary purpose of Yellowstone National Park is to provide present and future visitors with the opportunity to see and appreciate the natural scenery and native plants and animal life as it occurred in primitive America (NPS, 1967). In essence, the mission of the Park Service (Everhart, 1972) is coincident with preserving a natural ecosystem, or "natural ecosystems" management. If occasional overgrazing by ungulates or localized erosion is part of that natural ecosystem, then it is within the scope of the Park Service mission to accept and even to preserve those conditions.

The Bureau of Land Management is a multiple-use agency, however. Its agency mission stresses maximum utilization rather than preservation of the resources it manages. In particular, BLM is charged with the wise utilization of the Nation's rangeland resource with the concomitant responsibility to protect that resource from deterioration through overgrazing (BLM, 1967). Even though

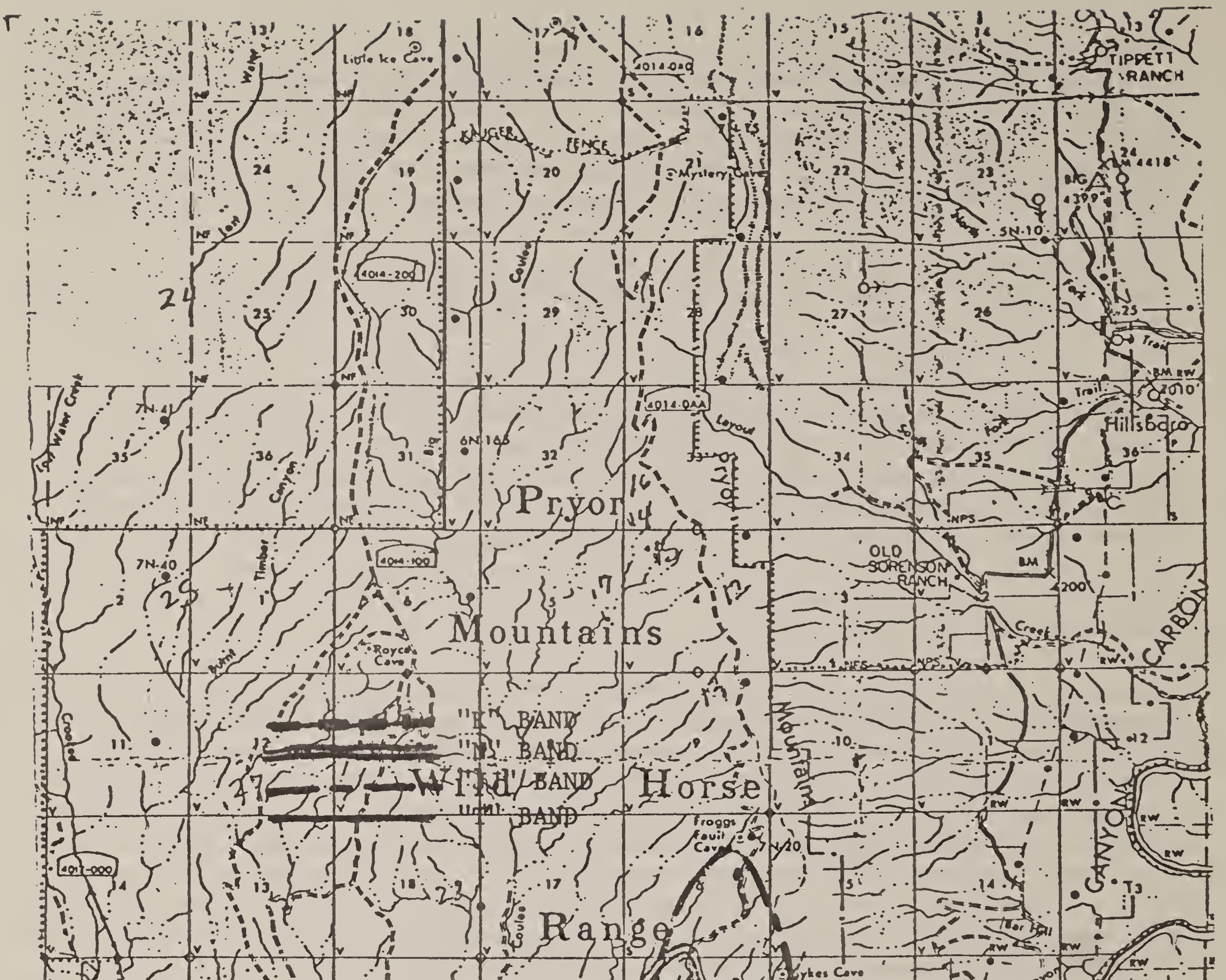


FIGURE #4 OVERLAP OF BANDS ON SYKES RIDGE

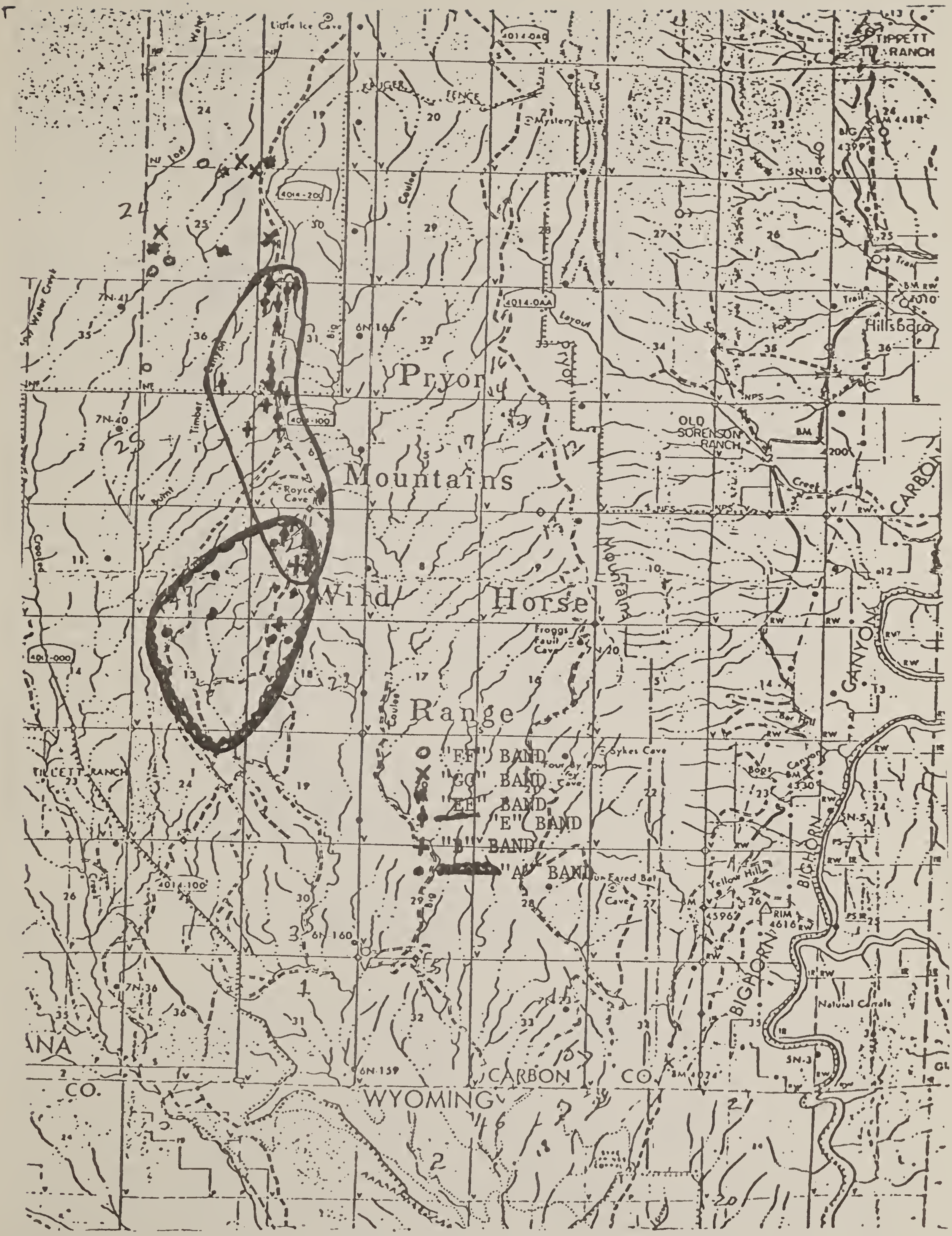


FIGURE #5 OVERLAP OF BANDS ON TILLETT RIDGE

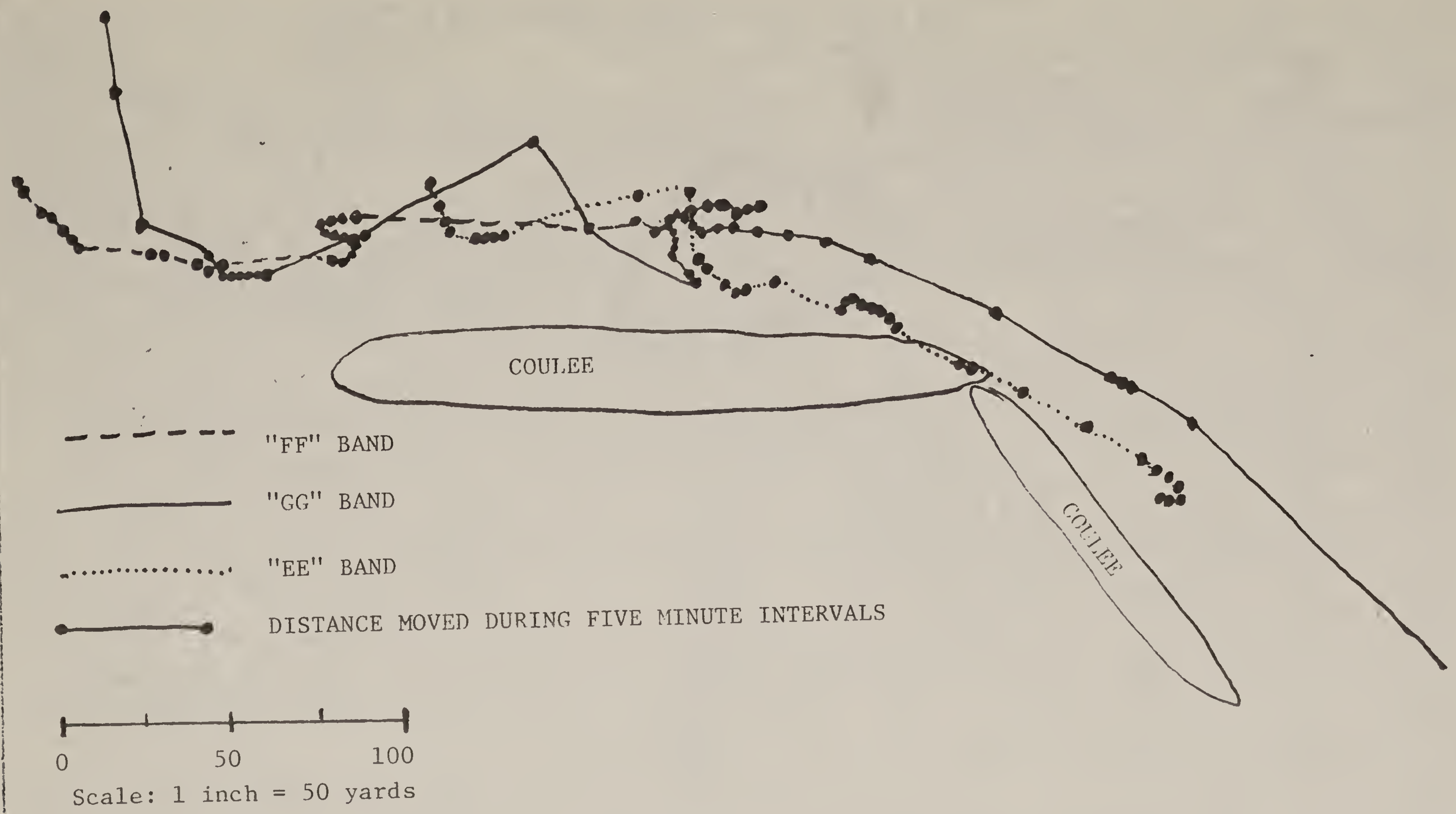


FIGURE #6

MOVEMENTS OF 3 BANDS BETWEEN 4 P.M. AND 7 P.M. ON AUGUST 5, 1975. NOTE THE OVERLAP IN USE OF THE RANGE the Pryors horses represent a resource of aesthetic rather than utilitarian value, their management under a "natural ecosystems" plan could be too wide a deviation from BLM's central agency mission to be acceptable. As an example, it would be difficult for BLM personnel to stress wise use of the range to ranchers while at the same time allowing winter die-offs of horses and localized overgrazing in the Pryors. It is possible that maximum yield range use is too intimate to BLM's agency identity to allow for deviation (even in special cases) at this time.

Even if "natural ecosystems" management were feasible for other wild horse ranges (and it undoubtedly could be), the specific case of the Pryors offers two additional barriers. First, a program of herd reduction and subsequent forage management has been in effect for four years. This policy has developed a good deal of momentum. Closely linked with the agency's sense of technical expertise, this type of policy momentum is extremely difficult to change (Schiff, 1966). Many dormant controversies would be resurrected if herd reductions were stopped altogether. A second disadvantage with the Pryors is that the range still does not provide a full complement of summer and winter range. A shortage of one seasonal range could result in that range being a limiting factor, heavier grazing on that range, and the perpetuation of a zootic disclimax in vegetation as a consequence. "Natural ecosystems" management works best when the area under management represents a complete ecological unit. This should be considered in future horse range designations.

An alternative to "natural ecosystems" management is a modified form of multiple use management. Here aesthetic and utilitarian uses are integrated, but the management of utilitarian uses of resources are modified somewhat to accommodate conflicting aesthetic values. In this case the aesthetic use is the dominant use while the utilitarian use is somewhat subordinate.

This type of management is being used by the Forest Service in Michigan to preserve nesting populations of Kirtland's Warblers (USFS, 1965; Radtke and Byelich, 1963). In this case silvicultural practices are altered to accommodate the warblers habitat preferences. Pulpwood harvests are still maintained but they take second place to maintaining the warbler population.

In essence, BLM is following this type of management program in the Pryors. A viable horse herd is being maintained with no cattle or sheep use of the horse range. At the same time, however, BLM is maintaining a viable range resource.

This type of management has a rather strict interpretive base, however. The multiple use background behind the management plan must be stressed. Care must be taken to insure that the correct resource values and their relative priorities are conveyed in the interpretive plan. In the case of the horse range, this means that the interpretive program must emphasize the multiple use nature of the reduction program. Put in concise terms, it is incorrect to say that the animals are being reduced for the good of the herd. Individual animals may starve but the herd will survive, reduction notwithstanding. The correct interpretive emphasis should stress the necessity of herd reductions to maintain a high quality range resource. This type of emphasis can then be fitted into a mission-oriented interpretive program allowing BLM to explain the value of sound range management on the National Resource Lands. This type of interpretive emphasis is more sound biologically, and more useful in acquainting the public with BLM.

TRAFFIC COUNTER ANALYSIS

Traffic counters were used to obtain estimates of visitor use of the Pryor Mountain Complex. Both pneumatic tube and magnetic loop traffic counters were used. Of the two, the latter type provided more accurate readings and was less susceptible to damage. Figure seven shows the location of each counter used during the study.

Table five provides a compilation of the traffic counter readings taken during the study period. Readings were taken each weekend in as close to a standard pattern and time period as possible. The results thus represent the use during the week before the date the counter reading was taken. Where government administrative and maintenance traffic represented a significant portion of total use, it was subtracted from the week's total.

At best, these readings represent a general estimate of traffic passing over the counters in the course of each week. More observations per week are necessary to gather data more pertinent to recreation design and management. The widely spaced nature of the counters and the conditions of some roads required an outlay of unavailable time, for more frequent recordings during this brief study. In addition to this general shortcoming, several biases specific to certain counters were discovered. These will be discussed, means for correction will be suggested, and a few basic conclusions will be drawn from the data.

Pneumatic tube counters provide readings of variable accuracy depending upon temperature, weather, vehicle weight, vehicle speed, and battery power. This type of traffic counter is also quite visible to the passing public and is extremely susceptible to vandalism, theft, alteration of readings, and damage. In two cases (listed in Table 5) pneumatic counters were tampered with and the subsequent readings are of no value. In another case (also listed) a pneumatic counter was destroyed. Both the Bureau of Land Management and the U.S. Forest Service should give serious consideration to replacing pneumatic tube counters with the more accurate magnetic loop counters in the appropriate locations.

The counter located on Forest Service lands (counter #10) is particularly difficult to interpret. The relatively low readings of counters six and nine suggest that much of the traffic over counter ten is two-way. The high density of Billings area users in this section of the Pryor Complex (see appendix 5) adds weight to this hypothesis. As a result, actual use of the National Forest lands is somewhat less than counter ten indicates. The amount of actual two-way traffic can only be estimated due to uncertainty as to how many vehicles pass over counter ten only once and leave the National Forest via counters six or nine. For this particular location a much more useful type of counter and use-estimation system is described by Wagar and Thalheimer (1969). Using the pneumatic counter presently available and 140 man-hours/summer provided by the Forest Service maintenance and fire crew, an extremely accurate method of sampling called "double sampling" could be employed to ascertain recreation use of the National Forest. The double sampling procedure is detailed by James (1966). Additional counters in the National Forest would be useful to separate visitor use of different facilities (i.e., Big Ice Cave, Dryhead Overlook, Sage Creek Campground).

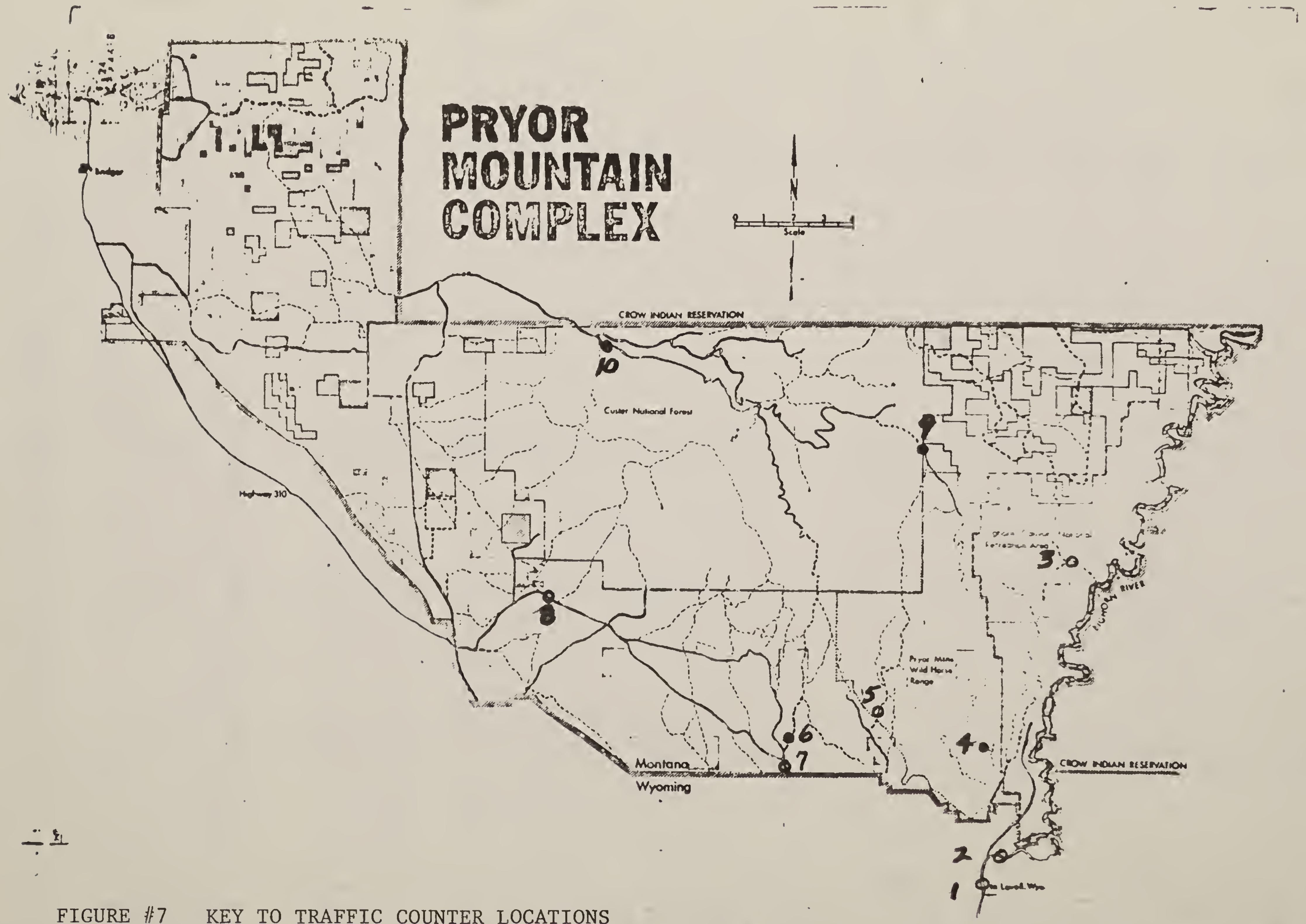


FIGURE #7 KEY TO TRAFFIC COUNTER LOCATIONS
- ● Pneumatic traffic counters
- o Magnetic loop counters

TABLE 5 TRAFFIC COUNTER DATA - SUMMER 1975

Reading for Weekend of	Sykes Bottom #4	Sykes Top #9	Tillett Ridge #5	U. Crooked Creek #7	L. Crooked Creek #6	Gyp Springs Road #8	Barry's Landing #3	Entrance NPS #1	Horseshoe Bend #2	USFS #10
7/12	37	19	12	--	146	102	--	335	276	515
7/19	45	48	25	118	101	57	264	1158	1002	1066
7/26	37	4	30	Damaged	84	80	204	998	925	717
8/02	33	Damaged	23	126	128	107	225	991	947	--
8/10	42	47	18	62	56	68	214	924	838	Destroyed
8/16	14	32	20	37	59	44	198	863	749	
8/23	23	25	14	73	93	61	128	291	424	

Counters located on Bureau of Land Management lands (counters #4,5,6,7,8,9) are subject to the same "two-way" bias. Many users of the area probably pass over certain counters twice (or more) in the course of a single recreation visit. Double sampling cannot be used to eliminate this bias due to the widely dispersed nature of recreation users on BLM lands. In addition, because of the nature of the road network servicing these lands, recreation use of counters seven and eight is interspersed with resident use. The percentage of resident use of these counters is unknown. At best, the counters on BLM lands can serve as indices for temporal or spatial comparisons of vehicular traffic. They are not particularly accurate estimates of actual recreation use.

Counters one, two and three on Park Service Lands obtain sufficient use to justify daily readings. Park Service personnel presently record data from these counters daily. Results can be obtained from Park Service offices in Lovell, Wyoming or Fort Smith, Montana. Weekly readings of Park Service counters are used in this study for purposes of comparison only.

In spite of many shortcomings, the data collected do indicate some conclusions. Use of the Pryor Complex is heaviest on the National Park Service and U.S. Forest Service managed lands. Personal observation suggests that almost all of the National Forest use is concentrated on weekends. Use of Park Service lands is somewhat distributed throughout the week with heavier use on weekends. Bureau of Land Management lands sandwiched between these two areas almost certainly receive some spill-off use from USFS and NPS lands. During weeks when counter readings were high on USFS and NPS lands, they were correspondingly high on BLM lands (see table 5). Recreation use of BLM lands, however, is still relatively low. Readings from counters four and five indicate that traffic use of the Pryor Mountain Wild Horse Range is the lowest of any area sampled in the Pryors Complex. Road conditions in the horse range are undoubtedly a major factor influencing these data. Other possibilities will be discussed in later sections.

The realization that recreation use from Park Service lands spills-off onto BLM lands suggests that Park Service plans for development of the Bighorn National Recreation Area (NPS, 1971) will affect BLM lands in the area. To date, these effects have not been quantified or accurately predicted. Because much of BLM's administrative and planning effort will be influenced by the intimate association of these two areas, some data (if only approximate) should be obtained concerning increased use of BLM lands as a result of Park Service development. Elsner and Oliveira (1973) suggest a method by which traffic counter readings and other easily obtainable data can be used to predict the impact of alternative forms of recreation development on surrounding areas, facilities, and road networks. Use of this method requires computer access and analysis, making it inapplicable for this particular study. If computer access can be obtained, the computer model that Elsner and Oliveira provide should be used to facilitate BLM planning efforts.

LOVELL TOURIST QUESTIONNAIRE ANALYSIS

A brief questionnaire (Appendix #1) was administered to eight randomly selected parties in out-of-state or out-of-county vehicles stopping at local motels and gas stations in Lovell, Wyoming. Lovell is the only major town acting as a service center for the Pryor Mountain Complex. Basic demographic data and reasons for passing through Lovell were collected. Sample size was limited by time constraints. It is possible that the relatively small sample size holds hidden biases. The following analyses and conclusions should be accepted with this in mind.

Table six represents a compilation of the data collected in the sampling process. Visitors from twenty-five states and two foreign countries were sampled as they passed through Lovell. Visitors traveling west outnumbered visitors traveling east 1.77:1. Route 14-A proved to be a more important travel route than Route 310. In all probability this trend will increase as 14-A is improved. The majority of tourist traffic will be moving through Lovell in an east to west direction. The large number of parties passing through Lovell as a result of prepared trip plans indicates that the American Automobile Association and other travel agencies are routing significant numbers of visitors through Lovell on 14-A. This trend should also increase as 14-A becomes an all-weather road. The average party size of 3.5 persons per party suggests the predominance of couples and medium-sized families.

The most important data collected were visitor motivations for passing through Lovell. These data indicate that the Pryor Mountains Wild Horse Range and the Bighorn Canyon National Recreation Area are chosen as a destination by only a small portion of out-of-area visitors. A somewhat higher proportion of out-of-state visitors is indicated for Bighorn Canyon National Recreation Area by the data in appendix four. When questioned, however, most of these visitors explained that they were passing through the area en route to another destination; or that they were visiting Bighorn National Recreation Area with friends living in the area. Few chose the recreation area as a final destination.

A majority of out-of-area users were simply passing through Lovell or traveling toward Yellowstone or Grand Teton National Parks. It is possible that many visitors listed themselves as "passing through" and were in reality heading for Yellowstone or Grand Teton National Parks. A surprising number of visitors listed the Bighorn Mountains as their destination. This corroborates a study being undertaken by the Big Horn and Park Counties Regional Planning Office (Nellis, personal communication). More visitors are selecting the Bighorn Mountains as a final destination.

Data such as those in table six should be collected on an annual basis. Visitation trends could then be assayed over time. High levels of visitation currently observed in the area could be a result of impending gasoline price increases. McCool and others (1974) predict that tourist dependent communities in the Intermountain Region will experience significant decreases in vacationer volume as gasoline prices rise close to seventy five cents per gallon. This conclusion was based upon an analysis of 586 households in three sample populations. The ineluctable conclusion of McCool's study for Lovell

TABLE #6

COMPILATION OF RESULTS OF QUESTIONNAIRES ADMINISTERED IN LOVELL, WYO. BETWEEN 6/20-7/23, 1975

#TRAVELING PARTIES	STATE
10	Wyoming
7	@ California, Wisconsin
6	@ Colorado, Michigan
5	@ Montana, Illinois
3	@ Iowa, South Dakota, Pa, Ohio, N.Y.
2	@ Minn., Utah, Ore.
1	@ Idaho, Mo., Vt., Okla., Nebr., N.J., Ind., Va., N.M., Del., Canada, France.

AVERAGE PARTY SIZE
3.5 persons/party

ENTERED TOWN BY:	
Rt 310	20 parties
Rt 14-A	62 parties

TRIP ROUTED BY:	
Trip plan	34 parties
Brochure	1 party
Newspaper	-------
Radio	-------
T.V.	-------
Magazine	1 party
Travel Show	-------
Highway Signs	3 parties
Friends	3 parties
Yourself	26 parties
Other	18 parties

MAJOR INTEREST IN AREA	
Passing through	31 parties
Big Horn National Rec. Area	7 parties
Pryor Mtn. Wild Horse Range	4 parties
Big Horn Mountains	37 parties
Yellowstone-Teton Parks	38 parties
Other	24 parties

Sample Size = 80 parties
Sampling Method = Random sample of out-of-state and out-of-county license plates.

is that, this summer many visitors may be making their "last trip to Yellowstone". Smith (1974), however, points out that this need not be the case. He predicts that tourism will not be seriously affected as long as gasoline supplies are plentiful and advertised. He suggests that local travel bureaus and chambers of commerce will stress that gasoline expenditures are often a small fraction of total vacation costs.

The overall conclusion to be drawn from the data in table six is that few out-of-area visitors choose the Pryor Mountain Complex as a final destination. Higher gasoline prices may decrease the number of out-of-area visitors using the Pryor Mountain Complex by decreasing the number of visitors passing through the area enroute to another destination.

WILD HORSE QUESTIONNAIRE ANALYSIS

Questionnaires measuring demographic data, recreation preferences, interpretive and development preferences, and attitudes toward wild horses were administered to users of the Pryor Mountain Complex. A copy of the questionnaire is provided in appendix two. Three different recreation user populations were sampled. Users of Custer National Forest were sampled at Sage Creek Campground, Big Ice Cave, Dryhead Overlook and along the Crooked Creek Road. Users of Bighorn Canyon National Recreation Area were sampled along the county road leading into the recreation area. Users of the Pryor Mountain Wild Horse Range were sampled by administering questionnaires to visitors participating in BLM-led tours of the horse range. A total of 33 visitors were sampled on the horse range; 100 were sampled at Bighorn Recreation Area; and 217 were sampled in Custer National Forest. The total sample size consisted of 350 recreation users. The results of these questionnaires are compiled in appendices three, four and five. The compilations are appended to the report, rather than included as data tables, due to their length.

The three sample populations will be evaluated together on a question by question basis. If differences in the data require their separate evaluation, they will be evaluated separately for the purposes of comparison. Time and equipment restrictions will confine data analysis to a fairly general level. In some cases, subtleties in the data will require computer analysis for adequate evaluation. In other cases, data are statistically inadequate or irrelevant. As a result of these shortcomings, analysis of the compilations will be fairly basic for most questions.

Question one was designed to assay the general awareness of the recreating public as to the opportunities available at each of the three major elements of the Pryor Mountain Complex. Of the three areas, the Pryor Mountain Wild Horse Range had been visited previously by the lowest percentage of all users sampled (40%). Custer National Forest and Bighorn National Recreation Area had been previously visited by a comparable number of users (Custer, 65%; Bighorn, 72%). The slightly lower figure for Custer National Forest is attributable to a high number of Wyoming residents and out-of-state tourists in the Bighorn National Recreation Area sample. Many of these users had never been to Custer National Forest.

Each visitor who indicated previous visitation at one or more of the sampled areas, was then asked to estimate the number of times he or she had visited each area. Local visitors experienced some trepidation with the question in some cases due to an extremely high number of visitations to a particular area. When pressed, however, most visitors could quantify their number of return visits. In all probability high standard deviations will make the mean values in the appendices irrelevant. As a general trend, however, it is noted that people return less often to the Pryor Mountain Wild Horse Range and most often to Custer National Forest. The high rate of return to Custer National Forest seems to be a function of a small group of users who have long chosen Custer as their favorite recreation facility.

Question twenty was designed to obtain a use radius for each of the three areas in the Pryor Mountain Complex. The data taken in the Pryor Mountain Wild Horse Range is biased toward an overrepresentation of non-local use as a result of relying upon BLM administered tours as a sampling vehicle. Ostensibly, local residents recreate in the horse range without the aid of organized tours because they are familiar with the area. The majority of Custer National Forest use seems to be the result of users coming from 26-100 miles away. This is undoubtedly a function of a preponderance of Billings and nearby Montana residents using the national forest. Use of Bighorn Canyon National Recreation Area seems to be fairly evenly divided between local, regional, and national use. The local use emanates primarily from Lovell and Powell; the regional use from other Wyoming (and some Montana) cities; and the national use as a result of the casual type of tourist use described in the preceeding section.

The twenty-first question was designed to ascertain the urban-rural background of the recreation users. These data will then be compared to attitudes concerning development alternatives and wild horses. The Pryor Mountain Wild Horse Range questionnaires again reflect a subtle bias. The majority of users sampled were college students on field trips. Although many listed a small town as their home town, they are now living in somewhat larger collegiate communities. When motivation and attitude data are discussed, it will be suggested that their attitudes reflect upon their current residence in larger communities. The majority of Custer National Forest users abide in urban areas. This is again a function of the percentage of Billings residents using the national forest. A high percentage of small town and rural use is also represented in the Custer sample. Small town and rural users provide the majority of the Bighorn National Recreation Area sample. Most of these users are centered in Lovell and Powell.

Question twenty-two is merely a compilation of hometowns and states represented by the sample populations. The Pryor Mountain Wild Horse Range sample again represents a sampled skewed toward national users. The Custer National Forest sample depicts the significant (both statistically and managerially) predominance of Billings users, with a wide scattering of out-of-state use. Most of the out-of-state users represent visitors recreating with local families rather than tourists passing through the area without local contacts, as in Bighorn National Recreation Area. The Bighorn National Recreation Area sample reflects a predominance of local and regional Wyoming-Montana use with a good representation from out-of-state users.

Question twenty-three was a query designed to ascertain overall visitor satisfaction with the recreation experience. Positive responses to the question were of the general satisfaction type similar to those obtained by Lucas (1970). If a negative reaction was obtained, the visitor was asked to explain the reason behind response. Only in Custer National Forest were negative responses (five) with managerial significance obtained. Crowding seemed to be the negative factor in all five responses.

The twenty-fourth question is a compilation of type of party (day use or overnight) and equipment types. All of the Pryor Mountain Wild Horse Range users were day users traveling in BLM four wheel drive vehicles. Day users comprised the great majority of users in Custer National Forest and Bighorn National Recreation Area. The higher number of trucks and four wheel drive vehicles in Custer National Forest suggests that these users are somewhat more mobile than users of Bighorn National Recreation Area. The large number of boats and campers in Bighorn National Recreation Area tends to support this supposition.

The remainder of the questionnaire deals with visitor motivations, attitudes toward the value of wild horses as a recreation experience, and preferences for development of the horse range. Aesthetic use of wildlife resources is an area of study needing considerable research (Hendee and Potter, 1972). The value of wildlife observation as a component of the total recreation experience is also an area with a limited research background. Lime and Cushwa (1969) suggest that wildlife is an aesthetic benefit to many recreation users, but not a prime motivational factor attracting them to a particular recreation facility. This is somewhat disputed by high visitor use and attraction to wildlife in National Wildlife Refuges (Trecker, 1965) and wildlife areas such as Yellowstone and Everglades National Parks (Reid, 1967). Ashcroft (1967) found that the Cache elk herd in Utah was reported as the feature attraction by ninety-eight percent of the winter visitors of the area. If little is known about aesthetic use of wildlife resources, less is known about the recreation value of wild horse herds. To date only a handful of BLM administrative and planning publications give consideration to possible aesthetic benefits derived from wild horses (BLM, 1966;1971;1972;1973;1974).

In some cases, the results of the data in appendices four, five and six can be interpreted in the light of past research efforts. In other cases the collection and interpretation of similar data in the past is unknown to the author.

Question two was designed to obtain the major recreation interest of the user, while question three attempted to ascertain the reason for the choice of a particular recreation area to fulfill that interest. Although relatively few users in each sample group listed wild horse viewing as a major motivational factor in choice of area, a high percentage were favorably disposed toward viewing wild horses. This parallels Lime and Cushwa's (1969) results to some extend.

The data in questions two and three also suggest a potential conflict of user groups in Custer National Forest. A significant portion of users indicated that their choice of the area was determined by a need to "get out" and find "peace and quiet" in a recreation area with "no people." These users represent the long-time Custer users referred to earlier. A second and larger group of users were attracted to the Big Ice Cave facility or a "new area to try" or a recreation area "close to home." Most of these users were from Billings and had visited the area less times, on the average, than members of the former group. The influx of new visitors could be a result of attraction to the Big Ice Cave facility, weather conditions in Billings; or it could represent a displacement of recreation users to areas closer to home as a result of higher gasoline prices (Boster, et al, 1974). At any rate, this does not yet represent a significant administrative problem. The level of negative response to crowding was relatively low and, for most visitors, crowding does not represent a problem (Stankey, 1973).

Questions four through seven were a simple attempt to estimate visitor awareness of the horse range and herd. Almost ninety percent of the local users had heard of the Pryor Mountain Wild Horse Range before. The majority of non-local users were also aware of the horse range. In a small number of cases the "Pryor Mountain Wild Horse Range" was the first thought associated with wild horses. A relatively lower number of users knew how to actually get into the Pryor Mountain Wild Horse Range. In particular, less Custer National Forest users knew how to enter the horse range. This is probably a function of a large number of Billings users in passenger cars who had not penetrated very far into the Pryors.

Question six indicates that even fewer users had driven into the Pryors specifically looking for wild horses. In question seven it is noted that a higher number of users had seen horses in a casual manner, than had driven into the Pryors with the specific intent of observing wild horses. This is also similar to results obtained by Lime and Cushwa (1969).

The objective of questions eight, nine, and ten was to discover what the average recreation user considered as an adequate viewing distance to observe wild horses. The problem of how close to let the viewing public approach wild animals without compromising the animals' wild nature has plagued resource managers for some time (Trecker, 1965; Reid, 1967; Flook, 1968). The data presented here represent an unprecedented attempt to quantify, for managerial purposes, the viewing distance that most often results in a satisfactory recreation experience.

The compilations presented in appendices three, four and five represent a rather unacceptable form of data representation. The standard deviations associated with the calculated mean values are sufficiently large to make the means statistically irrelevant. By comparing individual questionnaires, however, a significant trend is noted. When users who have already observed the horses at short range are excluded, a comparison of individual questionnaires indicates that the distance at which the average user expects to view the horses (expressed by question ten), is usually greater than the distance at which he or she would like to view the horses (expressed by question nine). The implication of this trend is that the inexperienced viewer has relatively low expectations regarding his or her ability to observe horses. This further implies that a satisfactory recreation experience can be created without providing opportunities to approach the animals too closely. If this is at all true, Trecker's (1965) concept of "observer zoning" can be applied without detracting from the quality of the recreation experience for most users. In essence, this concept suggests that observation points be located so that a natural, physiographic, or man-made boundary is placed between the observers and the wildlife population.

Questions fourteen, eleven, fifteen and sixteen were designed to assay the values of observing wild horses in both a general sense and a comparative sense, relative to other wildlife species. The rating of preference for viewing opportunities of different wildlife species is also a novel form of data collection.

Question fourteen was an attempt to quantify the relationship between users' attitudes toward wild horses and the intuitive perception each person has of what constitutes a wild animal. Recreation users were asked to state whether they felt wild horses were wild animals based upon their own cognitive definition as to what the term "wild animal" connoted. The question was not intended to examine or reflect the technical or legal aspects of the wild horse's status. Approximately seventy-two percent of the users sampled felt, intuitively, that wild horses were wild animals. Some users attempted to hedge their answers in technical or legal terms, but many simply responded to the question (either positively or negatively) in a spontaneous fashion. Twenty-eight percent of the users sampled felt that the horses did not qualify as wild animals. The general concensus among these users was that wild horses represented estrayed domestic stock, often of inferior quality.

Analysis of the negative responses to question fourteen on a questionnaire by questionnaire basis reveals three significant trends. First, most of the negative responses emanated from users originating from small towns or rural areas. Secondly, the majority of negative responses were expressed by users visiting from within a one hundred mile radius of the Pryor Complex. In other words, most of the recreation area users unfavorably predisposed to the concept of "wild horses" were local users. A third trend is noted when question fourteen is compared with questions seventeen, eighteen, and nineteen. An examination of individual questionnaires revealed a positive correlation between a negative response to question fourteen and the degree of association the user had with horses throughout his or her life. On the whole, people who rode often, owned a horse, or had owned horses in the past, were somewhat more negative in their attitudes toward wild horses than the average user.

Questions eleven and sixteen were designed to obtain a qualitative grasp of the benefits individual users perceived in observing wild horses. Several users indicated that no benefits were attained through observing wild horses. Comparison of these users' response with their response to question fourteen, indicates that the same basic sub-group of users is represented in the "none" response to question eleven.

Other answers to questions eleven and sixteen (i.e., "just enjoy seeing them," "exciting to see them wild and free," "an association with nature or wilderness," "educational value") are all extremely similar to response obtained by Lime and Cushwa (1969) in their survey question, "Why did seeing wildlife add to your camping trip in Superior National Forest?" Lime and Cushwa further indicate that responses such as "adds to the feeling of wilderness" and "being close to nature" suggest that wildlife is, in part, associated with visitors perception of the difficult-to-define term "wilderness." Similar wilderness association responses to questions eleven and sixteen imply that wild horses provide the same perceptual benefit to some users. The ineluctable conclusion of the above analysis is that, to many users, wild horses provide the same quality of recreation experience as do wildlife species.

Two additional responses to questions eleven and sixteen ("association with part of American's heritage," "satisfaction in just knowing that they are there") were not duplicated by similar responses to Lime and Cushwa's questionnaire. These responses indicate that, to some users, wild horses may have aesthetic or spiritual values unmatched by wildlife species. These data imply that some users derive a sense of satisfaction simply from knowing that wild horses do exist. For others, viewing wild horses provides an opportunity to experience superlative examples of natural environments and, at the same time, to gain a feeling of historical heritage. For some users an opportunity to see wild horses becomes what is defined by Tocher and Kopp (1973) as a peak recreation experience.

Question fifteen is, in essence, a simplistic attempt to see how wild horses compare on a scale with wildlife species in regard to excitement resulting from observing the animals listed. Users were asked to think in terms of aesthetic rather than hunting use for all the animals listed. It is interesting to note that two of the three animals that averaged higher ratings than the wild horse are on the endangered species list. The third animal higher than the horse is reasonably shy and difficult to observe. Wild horses consistently ranked higher than mule deer and the smaller animals listed. The preponderance of these data indicate that to many users the concept of a wild horse is not antithetical to their concept of a wild animal. Additionally, for some users sighting wild horses is equally, or more, exciting than seeing wildlife species.

Questions twelve and thirteen were included in the questionnaire to provide an index of visitor preferences for development or interpretation of the horse range. Question twelve gauged public response to the possibility of more directional and informational signs for, and on, the horse range. Approximately seventy percent of the users sampled favored additional signing of the horse range and additional signs directing people to the horse range. Local ranchers report that it is not uncommon for three or four parties of lost visitors per summer to stop and inquire of the whereabouts of the Pryor Mountain Wild Horse Range or other facilities in the Pryor Mountain Complex. Peterson (1974) noted similar results in talking with visitors at Big Ice Cave. Adequate signing in the Pryor Mountain Complex would also decrease the degree of differences in mean values obtained for questions six and seven. In addition to aiding visitors, signing can be used as a managerial tool to regulate, distribute, or encourage visitor use of certain areas. Brown and Hunt (1969) discuss the influence of information signs on visitor distribution and use.

Question thirteen provided the user with a range of interpretive and development alternatives for the horse range. Alternatives range from no development to high intensity development of the area. Visitors were asked to check their preferences. The small number of additional alternatives suggested by visitors implied that the list presented on the questionnaire was comprehensive. In some cases visitors selected alternatives that were mutually exclusive. Both preferences were accepted and compiled with the supposition that the visitor desired both uses under some form of zoning in the horse range.

The vast majority of users of the Pryor Mountain Complex preferred low intensity development alternatives in the Pryors. High rates of positive response were noted for primitive area designation of parts of the Pryor Mountain Complex, hike-in viewing areas for wild horse observation, jeep trails, brochures about the horses, and overlooks with viewing scopes. Low rates of positive response were obtained for herd regulation to insure sightings, and fencing portions of the horseherd to insure sightings. Just as fenced animals are not wildlife (Leopold et.al, 1963), most users felt that horses noticably restrained by fences were not wild horses. In general, little support was obtained for high intensity development in the area, especially in regard to paved access roads. The aversion to paved access roads corroborates data obtained in a study by Merriam and Ammons (1967).

On the margin, rural and small town residents using Bighorn National Recreation Area seemed to favor somewhat more intense development alternatives than did Billings users of Custer National Forest. Similar differences in rural-urban visitor preferences have been noted in other studies (Catton, 1967; Hendee et. al, 1967; Hendee et al, 1968; Hendee 1969). Other studies (Kirkpatrick, 1973; Schweitzer and Benson, 1975) have noted a preference among Montana residents for undeveloped recreation areas.

Further evaluation of the questionnaire data will be provided in the next section. Where appropriate, questionnaire analysis will be used to evaluate interpretive alternatives.

INTERPRETIVE PHILOSOPHY AND ANALYSIS OF POTENTIAL INTERPRETIVE SITES

The visitor preferences noted in the preceeding section suggest that intensive interpretive development of the Pryor Mountain Wild Horse Range would be supported by few visitors. A philosophy of restricting any development to the perimeter of the horse range would seem to be the best way to accommodate users and still maintain the "wild and free roaming" nature of the horse range. The wilderness association many visitors noted in conjunction with wild horses would not be seriously altered.

Another advantage of this philosophy is that it will prevent large numbers of auto-based visitors from penetrating the interior of the horse range and harassing the animals. Elsewhere (NPS, 1974), it has been suggested that large numbers of visitors will have little effect on the horses. The preponderance of data available (Tyler, 1971; Ryle, 1967; Laxlat, 1974) suggest constant and close contact with recreation area users will change the behavior patterns of feral or wild horses. In each case, the authors noted that easy access and larger numbers of visitors resulted in the horses becoming tame. In two cases "begging patterns" of behavior were developed by certain animals.

As a perimeter interpretive plan is developed, less intense forms of interpretation or development can be experienced as the visitor penetrates further into the horse range. This will act to slow the visitor down as he approaches the primitive area center of the horse range. At some point along this spectrum, the visitor will be required to proceed on foot in order to experience the interpretive program. The technique of slowing down the visitor as a prelude to entering a wilderness area is discussed by Lucas (1964) and Stankey (1973).

With the "perimeter concept" as an underlying framework, interpretive alternatives heavily favored by visitors will be discussed. Interpretive messages and methods for each will be suggested where appropriate, and possible locations will be evaluated for some alternatives.

Primitive area designation was favored by the largest number of recreation users. The present management plan (BLM, 1974) for the Pryor Mountain Complex calls for the designation of two primitive areas (Big Coulee and Lost Water Canyon). Since these two areas are adjacent it seems appropriate that they be combined into one large primitive area. This would be in contrast to the managerial tendency to fragment primitive and wilderness areas (Henning, 1971), and would provide more area for the horses to use in a relatively undisturbed state. The connection of the two areas could easily be accomplished by closing Tillett Ridge Road from the Uranium Mine to the northern intersection with Mystery Cave Road (see Fig. 8). Adequate four wheel drive access would still be provided by the Mystery Cave Road--Crooked Creek Road loop.

The high popularity of hike-in viewing areas and overlooks with viewing scopes indicates that many visitors would enjoy a designated area where they have a high probability of seeing wild horses. Figure three indicates four areas where horses concentrate in sufficient numbers to make observation a high probability experience.

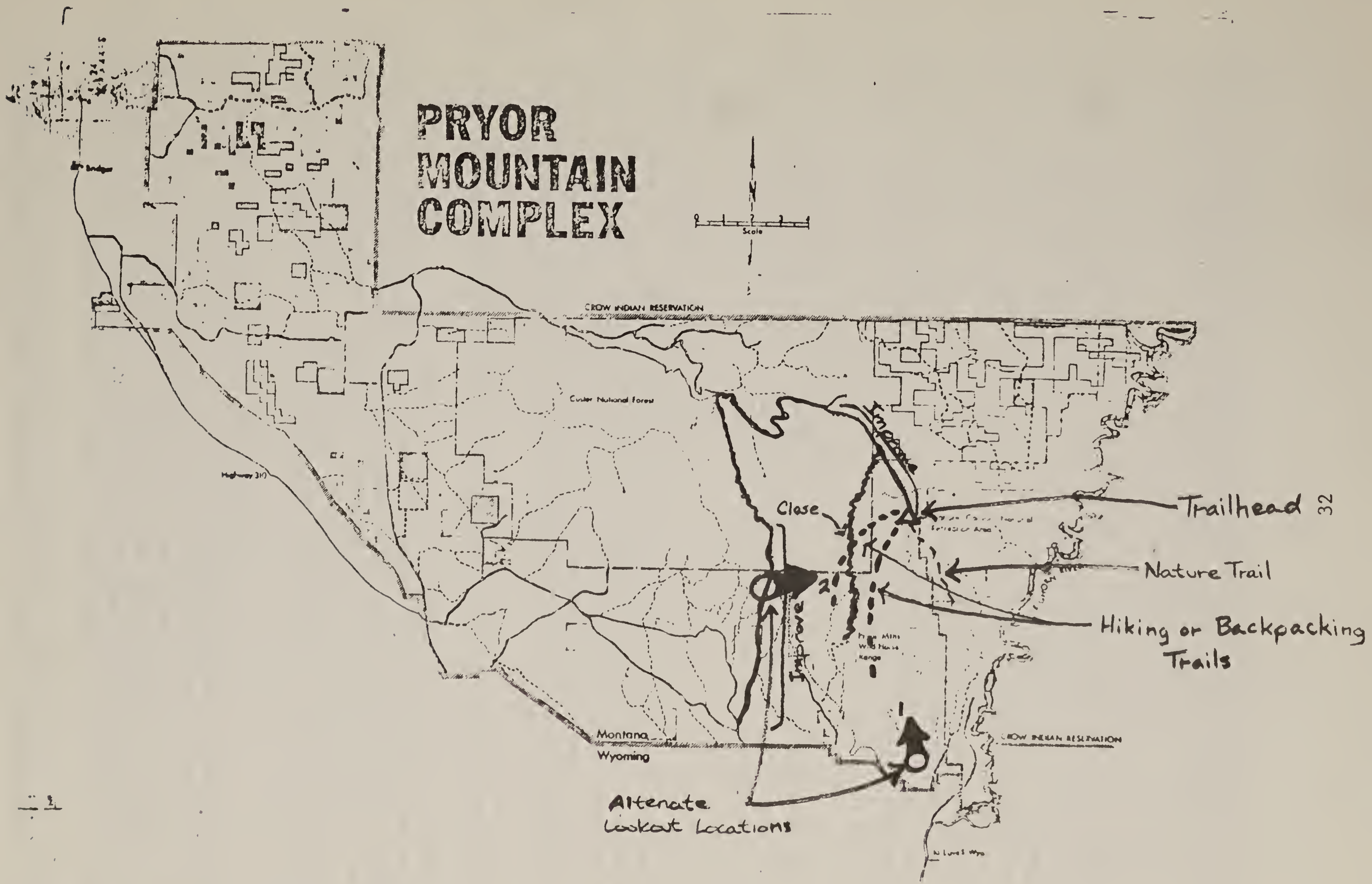


FIGURE #8 INTERPRETIVE ALTERNATIVES

Area four is along the route of the proposed Transpark Road. Park service plans for development of that particular area (ie., a riding stable) may make wild horse observations less frequent in years to come. Any wild horse interpretation along the Transpark Road should be left to National Park Service personnel.

Both areas one and three are within view of sufficient road access to merit consideration for drive-in overlook facilities. Area three is presently being considered as the site of a visitor overlook. The site will overlook the southern end of the horse range, and visitors will be afforded an opportunity to view horses at Cottonwood Springs (Fig. 8). The "observation zone" principle (Trecker, 1965) is used due to the barrier between people and horses created by Big Coulee. The site is easily accessible from the section of the Transpark Road that is now paved. The site possesses several disadvantages, however, in regard to its location on the horse range. If the Transpark Road fails to be extended to Hardin, Montana, the overlook site will be easily accessible only through Wyoming. It is questionable whether the majority of users of the northern end of the Pryors would use the site. Secondly, the site requires additional road construction to accommodate the heavy type of recreation vehicles (boats, trailers) using the Transpark Road. Third, the site is located in one of the most fragile ecosystems in the Pryors Complex. Uncontrolled visitor use of the overlook site could cause significant damage to fragile rock outcroppings, the thin desert crust, and desert vegetation in the area. Finally, the view from the overlook is marred by views of the Mystery Cave Road, the paved Transpark Road, corrals at Cottonwood Springs, and a large power line.

A second potential overlook site affords a view of horse concentration area one, the Crooked Creek Canyon, Demijon Flats and the western end of the horse range. This overlook would be located on the Crooked Creek Road above Demijon Flats (Fig. 8) and would enable visitors to observe concentrations of wild horses on the breaks above Crooked Creek Canyon. Crooked Creek Canyon would provide the boundary between the observers and the horses. The proposed site is in an upland sage meadow and is not as fragile as the alternative site. If the quality of the Crooked Creek Road were maintained at a level comparable to that of the road leading to Big Ice Cave, the overlook site would have adequate passenger vehicle access from both Montana and Wyoming. A disadvantage in the site location is that the tepee rings on Demijon Flats would have to be protected or well interpreted to avoid damage through additional visitor impact. A spur nature trail could be developed onto the flats for this purpose.

The interpretive message and methods concerning horses would be the same at either overlook location. The overlook would be an unmanned shelter-type interpretive facility. If high visitor use results in the needs for a manned interpretive program at the site, a sampling method described by James and Quinkert (1972) could be used to determine periods of peak use and, subsequently, appropriate times to staff the facility.

The interpretive display for the horses should progress, in a logical way, from a general level of information, to specific information concerning the Pryor Mountain Wild Horse Range and the management programs being used on the horse range. This ties in the concept of "mission-oriented interpretation" discussed in an earlier section. Figure nine diagrams the pattern the interpretive message should take and provides source materials for each step.

Most of the interpretive message will, of necessity, be conveyed by signboards and dioramic plaques. Directions for construction of rustic interpretive signboards are provided by Cooper (1969) and BLM (1972). Another rather simple interpretive medium that should be used is an audio message to the visitor through his car radio via a hidden radio transmitter. This method is currently employed by the National Park Service to convey greater quantities of information than the average visitor will absorb through interpretive signs. In addition, several researchers have demonstrated that multi-media interpretive programs are more exciting to the visitor and more effective in conveying their message (Field and Wagar, 1972; Washburne and Wagar, 1972; Wagar, 1972).

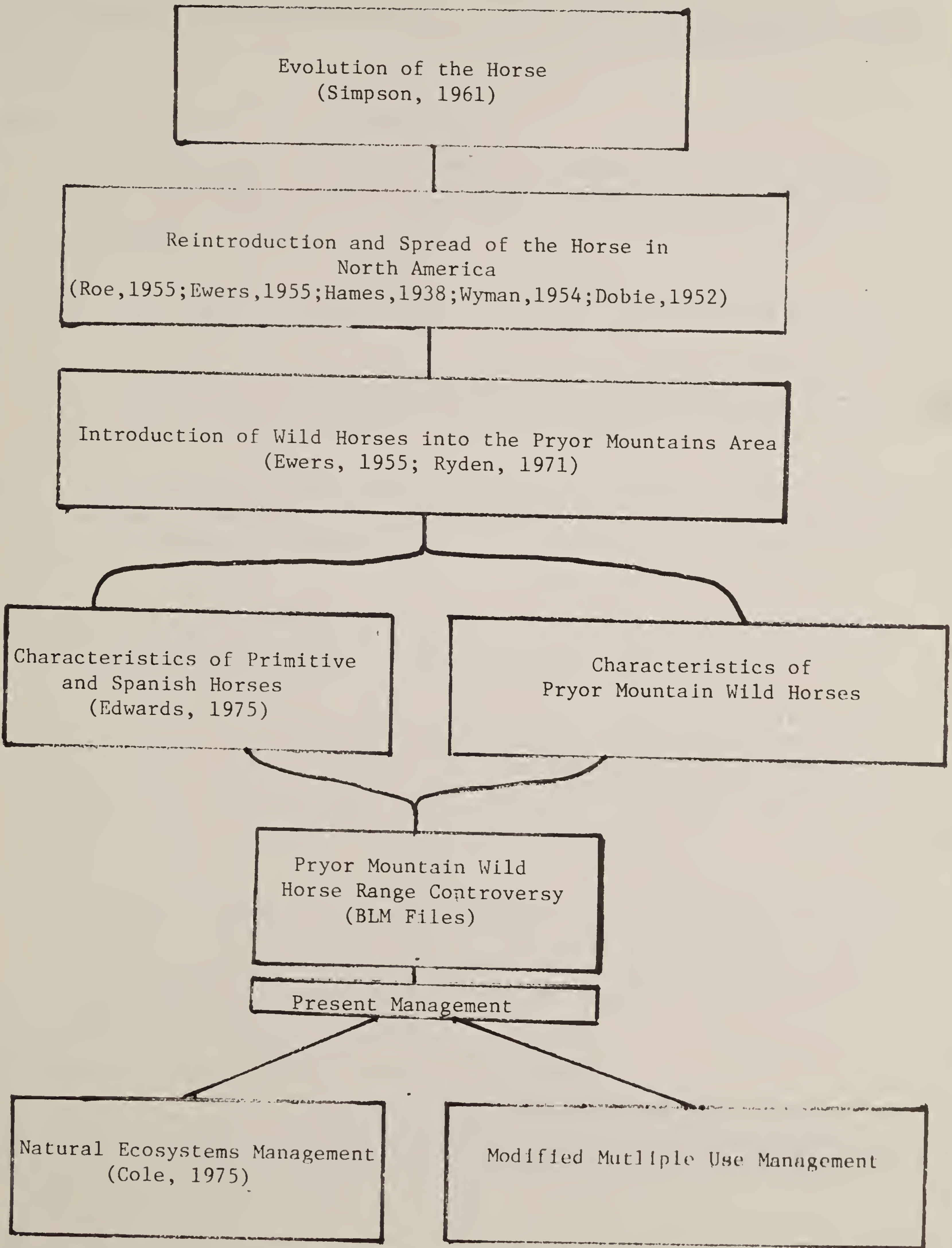
The desire for hike-in viewing areas could be satisfied best on the north end of the horse range. The jeep trail from Dryhead Overlook and Mystery Cave is presently a morass of four wheeldrive scars, wider than many of the gravel roads in the Pryors Complex. Use of the jeep trail in the early spring by four wheel drive vehicles has cut numerous scars into the surrounding meadows. This road should be graveled and brought up to the standard of the road to Big Ice Cave. Any damage caused by bringing increased use into the area will be compensated by the correction of four wheel drive scars on the site of the present jeep trail. Four wheel drive use of the area should be regulated by posting and patrols. New users to the area will be much easier to regulate than users with established patterns of off-road use (Thomas et al, 1974). Road improvement should end at Mystery Cave (Fig. 8).

Mystery Cave can then be developed to serve as a trailhead for hiking and/or backpacking use of the area. A nature trail developed from Mystery Cave could make horse concentration area two (Fig. 3) accessible to visitors who wish to view horses on foot. The use levels should be sufficiently low (and quiet) to avoid disturbing the horses to any great extent. The nature trail would have to be designed to avoid paralleling or often crossing the part of the Mystery Cave Road which would remain as a jeep trail. Interaction between hikers and four wheel drive vehicle users could cause conflicts similar to those described by Stankey (1973). A guide for planning nature trails has been published by the Forest Service (1974). The nature trail should be self-guided but BLM personnel may occasionally wish to lead tours on the trail. Mystery Cave could serve as a trail head for additional hiking or backpacking trails into the primitive area. Two trails could follow the bottoms of Big Coulee and Lost Water Canyon. Both of these areas possess sufficient scenic superlatives to attract hikers.

The desire for a self-guided auto tour could easily be satisfied as new areas are added to the south of the horse range. When the southern boundary is moved out to the county road, parts of that road could serve as a route for a self-guided auto tour. Present levels of use, however, do not justify such a development.

The above analysis of interpretive alternatives represents primarily low key types of interpretive development. Preferences of visitors to the area, and the capability of the resources in question to support various types of use

FIGURE #9 DIAGRAMATIC SCHEME FOR INTERPRETIVE MESSAGE


Evolution of the Horse
(Simpson, 1961)
Reintroduction and Spread of the Horse in North America
(Roe,1955;Ewers,1955;Hames,1938;Wyman,1954;Dobie,1952)
Introduction of Wild Horses into the Pryor Mountains Area
(Ewers, 1955; Ryden, 1971)
Characteristics of Primitive and Spanish Horses
(Edwards, 1975)
Characteristics of Pryor Mountain Wild Horses
Pryor Mountain Wild Horse Range Controversy
(BLM Files)
Present Management
Natural Ecosystems Management
(Cole, 1975)
Modified Mutliple Use Management

were criteria used in selecting interpretive alternatives. It is not believed that more intensive development would aid in providing a more comprehensive interpretive program. As Aldo Leopold (1966) writes, "The only true development in American recreational resources is the development of the perceptive faculty in Americans".

RECOMMENDATIONS AND EXECUTIVE SUMMARY

The following recommendations are made in light of the data presented in the body of the report. These recommendations will serve as the report's conclusions.

Recommendations for wild horse management

1. Continue collecting whole-herd data on an annual basis. This provides a much more accurate index of the progress of the herd than can be obtained through aerial surveys. A summer-temporary employee could be hired for this purpose.

2. Due to this year's low colt crop and the condition of the range it is quite likely that no spring, 1976 "excessing" operation will be necessary.

3. The Uranium Mine on Tillett Ridge should be improved to hold water all year, every year. A significant number of horses are using this as a water source. The same applies to the USFS gravel pit on upper Tillett Ridge.

4. As lands are added to the southwest corner of the horse range, they should be unfenced. Use only one south boundary fence. This will facilitate east-west movement of horses and help to eliminate the "two herd" phenomenon.

5. Remove the fence at Cottonwood Springs if the present overlook site is developed into an overlook. The fence is visible from the overlook and is visually unattractive and inappropriate to the setting.

6. A three year old buckskin stud ranging along the Transpark Road is quite tame as a result of being reintroduced to the range after being nursed back to good health in a corral. In the future, sick horses (foals, mainly) should be left on the range to fend for themselves; or, if removed, should be put up for adoption rather than returned to the range. The specific horse in question is not a particularly wild animal.

7. If the Transpark Road is completed, horses in the general area should be monitored for changes in behavior patterns. If a particular horse becomes too "tame" (ie., seeks tourist handouts), it should be removed to the backcountry portions of the horse range or put up for adoption. The program, if established, should be similar to the present bear management program at Yellowstone National Park.

Recommendations for interpretation and development

1. Much more adequate signing is needed in the Pryor Mountain Complex. In particular, more directional signing is needed at entrances to the complex and at crossroads. The value of adequate signing as a management tool has already been discussed.

2. In contrast, some signs are not necessary. In particular the "Antiquities Act" and "land closure" signs at the Indian fire hearths in Vermillion Valley are unnecessary. They serve only to draw attention to the vulnerable sites.

3. Better traffic counter analysis of the Pryor Mountain Complex is necessary. In particular, the effects of finishing the paved Transpark Road should be quantified. The impact on other recreation lands in the vicinity is generally unknown. A WICHE Intern with computer programming skills and access to a computer facility could provide this analysis in the course of a summer.

4. The actual overlook site should be chosen from the two alternatives, after it is determined whether the Transpark Road will be completed. If the Transpark Road is completed, the present site would be best. If the Transpark Road is not completed, the Crooked Creek Road site offers more advantages.

5. The interpretive media at the overlook site should consist of viewing scopes, flatwork exhibits, brochures, and an audio exhibit via a hidden radio transmitter. Again, a WICHE Intern with audio-visual communications skills could provide the recording for the transmitter and help to design the brochure. The intern would work closely with the district recreation planner and the district environmental education coordinator.

6. Close Tillett Ridge Road from the Uranium Mine to the north intersection with Mystery Cave Road. Connect Lost Water Canyon and Big Coulee Primitive Areas.

7. Improve (just gravel) Crooked Creek Road and the road from Dryhead Overlook to Mystery Cave. Bring these roads to a quality similar to that of the road leading to Big Ice Cave.

8. Stop this road improvement at Mystery Cave. Use the Mystery Cave area as a trailhead for hiking or nature trails. A four mile round-trip nature or hiking trail could be developed from Mystery Cave to Mystery Cave Overlook.

9. Restore Cummings Cabin on the road from Dryhead Overlook to Mystery Cave. The cabin could be made into an adirondack-type shelter, useful for hikers, hunters, and cross-country skiers.

10. If a self-guided auto tour becomes necessary, use the county road along the southern boundary of the horse range for this purpose. In this case, the boundary fence should be moved to the private-land side of the road so that visitors are not forced to view wild and free roaming horses through a fence.

11. Fencing, in general, should be kept to a minimum in areas of visitor use because of the psychological impact a fence has on the recreation experience associated with viewing wild horses.

12. If a visitor center becomes necessary, it should be located in Lovell, Wyoming rather than on the horse range. This is in keeping with the general concept that development becomes sequentially less intense as the horse range is approached and entered.

13. During the spring reduction operation a uniformed interpreter should be present (with mobile interpretive displays) at the working and holding corrals. He or she would interpret the methods and goals of the reduction. The uniform will identify the interpreter as a BLM employee. Curious members of the public would be drawn to the uniform. This will keep visitors out of the way of the reduction activities. The interpreter will also provide BLM with another chance to explain the management program used on the horse range.

LITERATURE CITED

1. Allen, Eugene O., 1968, "Condition and Productivity of White-tail Deer in Montana", J. Wildl. Mgmt. 32(1):130-141

2. Ashcroft, William H., 1967, "The Socio-economics of Recreational Use of the Cache Elk Herd"
unpublished M. S. Thesis Utah State Univ. 77 pp.

3. Blackstone, D. L., 1936, "Structure and Stratigraphy of the Pryor Mountains, Montana", Phd Thesis, Princeton Univ.

4. ________________, 1940, "Structure of the Pryor Mountains, Montana" Journ. Geol 48(6):590-618

5. Boster, Ron S., Paul O'Connell and James Thompson, 1974, "Recreation Uses Change Mogollon Rim Economy" AR 23(8):1-7

6. Brown, L. A., 1968, "Archeology of the Lower Bighorn Canyon, Montana", Archeol Mont 9(4)

7. Brown, Perry and John Hunt, 1969, "The Influence of Information Signs on Visitor Distribution and Use" Journ Leis, Res. 1(1):79-83

8. Bruemmer, Fred, 1967, "The Wild Horses of Sable Island" Animals 19(1):14-17

9. Bureau of Land Management, 1966, A Management Plan for the Nevada Wild Horse Range, Nevada State Office, Reno

10. ______________________, 1967, Division of Range Mission Statement BLM Man. 1603, Washington, D. C.

11. ______________________, 1968, Apsuroka Resource Area Soil Survey Billings District Office

12. ______________________, 1971, Pryor Mountain Wild Horse Recreation Lands-a Management Plan Billings District Office

13. ______________________, 1972, Pryor Mountain Wild Horse Recreation Lands-Interpretive Development Plan Denver Service Center

14. ______________________, 1973, Land Use Recommendations for the Pryor Mountains Billings District Office

15. ______________________, 1974, Pryor Mountain Complex - Land Use Decisions Billings District Office

16. Catton, William, 1967, "Attitudes of Car Campers and Back-country Visitors" Univ. Wash. Inst. Soc. Res. ISR 67-123 27 pp.

17. Caughley, Graeme, 1974, "Bias In Aerial Survey", J. Wildl. Mgmt. 38(4) 921-933

18. Cole, Glen, 1967, "Elk Ecology and Management Investigations", Nat'l Park Serv Prog Rept

19. __________, 1969, "Mission Oriented Research in Natural Areas of the National Park Service", Nat'l Park Serv Res Note #5

20. __________, 1971, "An Ecological Rationale for the Natural or Artificial Regulation of Native Ungulates in Parks", Trans N. Am. Wildl Conf 36:417-425

21. __________, 1972, "Grizzly Bear--Elk Relationships in Yellowstone National Park", J. Wildl Mgmt 36(2):556-561

22. __________, 1975, "Natural vs. Man Caused Deaths of Wild Animals in National Parks", N.P.S. Info Paper #26

23. Cooper, Glenn A., 1969, "Durable Rustic Signboards", USFS Research Paper NC-29

24. Cowan, I. M., D. Chapman, R. Hoffmann, D. R. McCullough, G. Swanson, R. Weeden, Report of the Committee on the Yellowstone Grizzlies ms Nat's Acad. Sci. Wash., D. C.

25. Despain, Don G., 1973, "Vegetation of the Big Horn Mountains, Wyoming, In Relation to Substrate and Climate" Ecol Monog 43(3):329-355

26. Dobie, J. Frank, 1952, The Mustangs, Boston: Little, Brown Co.

27. Edwards, Jeff, 1975, "Characteristics of the Primitive Horse", Unpub. Manu. Porterville, Calif.

28. Elsner, G. H. and R. A. Oliveira, 1973, "Predicting Traffic Load Impact Of Alternative Recreation Developments", USFS Res Paper PSW-96

29. Everhart, William, 1972, The National Park Service, New York: Praeger Pub.

30. Ewers, John C., 1955, The Horse in Blackfoot Indian Culture, Washington, D. C.:G.P.O.

31. Field, Donald R., and J. Allan Wagar, 1972, "Visitor Groups and Interpretation in Parks and Other Leisure Settings", Paper presented to: Third World Congress of Rural Sociology

32. Feist, J. D., 1971, "Behavior of Feral Horses in the Pryor Mountain Wild Horse Range" ms. thesis: Univ. Michigan

33. Flook. D. R., 1968, "Wildlife Management in Canada's Rocky Mountain National Parks", Paper presented to: International Short Course on Admin. Nat'l Parks

34. Haines, Francis, 1938, "The Northward Spread of Horses Among Plains Indians" Am. Anthrop. 40:429-437

35. Hall, Ron, 1972, *Wild-Horse Biology and Alternatives for Management* BLM Billings District Office

36. Harvey, David, 1974, *A General Historical Survey of the Pryor Mountains* Boulder, Colo: WICHE

37. Hendee, John, 1969, "Appreciative versus Consumptive Uses of Wildlife Refuges: Studies of Who Gets What and Trends in Use", *Trans. N. Am Wildl. Conf.* 34:252-264

38. Hendee, John and Dale Potter, 1971, "Human Behavior and Wildlife Management: Needed Research", *Trans. N. Am. Wildl. Conf*. 36:283-295

39. Hendee, John, T. H. Steinburn and W. C. Catton, 1967, "Wildernism--the Development, Dimensions, and Use of an Attitude Scale:, Paper presented to: Nat. Res. Sec. Rural Sociol. Meeting

40. Hendee, John, W. R. Catton, L. D. Marlow and C. F. Brockman, 1968, "Wilderness Users in the Pacific Northwest--Their Characteristics, Values, and Management Preferences", *USFS Res. Paper PNW-61*

41. Henning, Daniel H., 1971, "The Ecology of the Political/Administrative Process For Wilderness Classification" *Nat. Res. Journ.* 11:69-75

42. Houston, Douglas, 1968, "Shiras Moose in Jackson Hole Wyoming", *NPS Tech Bull. #1*

43. ________________, 1971, "Ecosystems in National Parks", *Science* 172: 648-651

44. Husted, W. M., 1969, "Bighorn Canyon Archeology" Smithsonian Inst. River Basin Surveys, Pub. in Salv. Archeol. No. 12

45. James, George A., 1966, "Instructions for Using Traffic Counters to Estimate Recreation Visits and Use on Developed Sites", USFS *S. E. Forest Exper. Stat. Pub*.

46. James, George A., and Anthony Quinkert, 1972, "Estimating Recreational Use at Developed Observation Sites", *USFS Res. Paper SE-97*

47. Kendeigh, S. C., 1947, "Bird Population Studies in the Coniferous Forest Biome During a Spruce Budwork Outbreak", *Biol. Bull #1* Ont. Dept. Lands and Forests

48. Kirkpatrick, Thomas O., 1973, "Outdoor Recreation in Montana: Characteristics of Participants", *Mont Bus. Q.* 11(2):35-48

49. Klingel, Hans, 1965, "The Social Organization and Population Ecology of the Plains Zebra", *Zool. Africana* 4(2):249-263

50. _______________, 1969, Zur Sozcologie Des Brevy - Zebras Verndt. dt. Zoolog. Ges in Wurzburg (Zool Anz Suppl. 33) 311-316

51. Klingel, Hans, 1972, "Social Behavior of African Equidae" Zool Africana 7:175-186

52. Laxlat, Robert, 1974, "The Enduring Pyrenees", Nat'l Geog 146(6):810-811

53. Leopold, Aldo, 1966, A Sand County Almanac New York: Oxford Press

54. Leopold, A. S., S. A. Cain, C. M. Cottam, I. N. Gabrielson, T. L. Kimball, 1963, "A Study of Wildlife Problems in National Parks", Trans. N. Am. Wildl. Conf. 29:28-45

55. Lime, David W. and Charles Cushwa, 1969, "Wildlife Aesthetics and Auto Campers in the Superior National Forest" USFS Res Paper NC-32

56. Loendorf, L. L., 1969, "Pryor Mountain Archeology", Archeol. in Montana 10(1-2):21-52

57. _______________, 1969, "The Results of the Archeological Survey in the Pryor Mountain-Bighorn Canyon Recreation Area, 1968 Field Season", ms. Univ. Montana

58. Lucas, Robert C., 1964, "The Recreational Capacity of the Quentico--Superior Area", USFS Res Paper LS-15

59. _______________, 1970, "User Evaluation of Campgrounds on Two Michigan National Forests" USFS Res Paper NC-44

60. McArthur, Robert, 1958, "Population Ecology of Some Warblers of Northeastern Coniferous Forests" Ecology 39(4):599-619

61. McCool, S. F., B. Brackett, G. Glover, G. Lewis, P. Martin, D. Fraweek, A. Turner, 1974, "The Energy Shortage and Vacation Travel", Utah Tourism and Rec. Rev. 3(2):1-5

62. Meagher, Mary, 1973, "The Bison of Yellowstone National Park", NPS Sci. Monog #1

63. Merriam, L. C. and R. B. Ammons, 1967, "The Wilderness User in Three Montana Areas", Bull. School Forestry, Univ Minn.

64. National Park Service, 1967, "Management Objectives for Northern Yellowstone Elk", Yellowstone Nat'l Park Pub

65. _____________________, 1971, Master Plan-Bighorn Canyon National Recreation Area Washington, D. C.:G.P.O.

66. _____________________, 1974, Final Environmental Impact Statement: Proposed Transpark Road, Bighorn Canyon National Recreation Area Washington, D.C.: G.P.O.

67. O'Gara, B. W., 1969, "Unique Aspects of Reproduction in the Female Pronghorn", Amer. J. Anat 125:217-231

68. Pellegrini, Steven, 1971, "Home Range, Territoriality and Movement Patterns of Wild Horses in the Wassuck Range of Western Nevada', ms thesis, Univ. Nevada, Reno

69. Peterson, Henry, 1974, "Memoirs of a Shy Tour Guide" USFS, Red Lodge, Mont.

70. Radtke, Robert and John Byelich, 1963, "Kirtland's Warbler Management", Wilson Bull 75(2):208-215

71. Reid, Neil J., 1967, "Public View of Wildlife", UICN New Series Pub #7 pp 77-81

72. Riney, Thane, 1964, "The Impact of Introduction of Large Herbivores on the Tropical Environment", UICN New Series Pub. #4 pp 261-273

73. Roe, Frank G., 1955, The Indian and the Horse, Norman: Univ Okla. Press

74. Ryden, Hope, 1970, America's Last Wild Horses New York: Ballantine Books

75. Ryle, G. B., 1967, "The Ecological Impact of Recreation and Tourism Upon the Forest Lands of Britain With Special Reference to the New Forest", UICN New Series Pub. #7 pp 192-199

76. Schiff, Ashley, 1966, "Innovation and Administrative Decision Making: The Conservation of Land Resources", Admin Sci Quarterly XI:1-30

77. Schweitzer, Dennis and R. J. Benson, 1975, "A Descriptive Analysis of Montana's Forest Resources", USFS Res Bull Int-11

78. Simpson, George G., 1961, Horses New York: Doubleday

79. Smith, Stephen L., 1974, "Leisure Under the New Conditions of 'Tight Energy' ", paper pres. to: Energy Symposium Mich. St. Univ.

80. Stankey, George H., 1973, "Visitor Perception of Wilderness Recreation Carrying Capacity", USFS Res. Paper Int-142

81. Thomas, J. W., J. C. Pack, W. H. Healy, J. D. Gill and H. R. Sanderson, 1974, "Territoriality Among Hunters -- The Policy Implications", Trans. N. Am. Wildl. Conf 38:274-280

82. Tocher, Ross and Hans Kopp, 1973, "People and Forests: The Challenge of Forest Recreation", Oxford Univ Forest Soc Journ 7(3):13-26

83. Trecker, Edgar, 1965, "Recreation on the National Wildlife Refuges", paper pres at: Midwest Fish and Wildl. Conf.

84. Tyler, Stephanie, 1972, "The Behavior and Organization of the New Forest Ponies", Animal Behav. Monog 5:83-197

85. U. S. Forest Service, 1965, "Management Plan for the Kirtland's Warbler Management Area", Huron Nat'l Forest

86. Verme, L. J., 1971, "Summary", in White-tailed Deer in the Midwest USFS Res Paper NC-39

87. Wagar, J. Allan, 1968, "Non-Consumptive Uses of the Coniferous Forests, With Special Relation to Consumptive Uses" Symp on Conif Forests No. Rocky Mtn., Univ. Montana 19 pp

88. ______________, 1972, "Evaluating Interpretation and Interpretive Media", paper presented to: Assoc. Interp. Naturalists.

89. Wagar, J. Allan and Joel F. Thalheimer, 1969, "Trail Results of Net Count Procedures for Estimating Visitor Use at Developed Recreation Sites" USFS Res Note Int-105

90. Washburne, J., and J. Allan Wagar, 1972, "Evaluating Visitor Response to Exhibit Content", Curator XV(3):248-254

91. Wymann, Walker D., 1945, The Wild Horse of the West Lincoln: Univ. Nebr. Press.

APPENDIX #1

LOVELL TOURIST QUESTIONNAIRE

Business ______________________________

Home town and state ______________________________

Number in party ______________

How did you enter town?

Route 14-A ________

Route 310 ________

How was your trip routed through Lovell?

Trip plan ________

Brochure ________

Newspaper ________

Radio ________

T.V. ________

Magazine ________

Travel Show ________

Highway Signs ________

Friends ________

Yourself ________

Other ________

What is your major interest in the area?

Passing through ______________

Bighorn National Recreation Area ________

Pryor Mountain Wild Horse Range ________

Big Horn Mountains ______________

Yellowstone-Teton Parks ______________

Other ______________________

APPENDIX #2

PRYOR MOUNTAIN WILD HORSE RANGE
QUESTIONNAIRE--INTERVIEW SHEET

1. Have you ever been to Bighorn Recreation Area before? ______ How many times? _______ Have you ever been to the Pryor Mountain Wild Horse Range before? _______ How many times? ________ Have you ever been to Custer National Forest before? ______ How many times? ________

2. What is your major interest in coming here?

3. Why did you choose this area (Bighorn, Custer, Pryor)?

4. Do you know about the Wild Horse Range and herd? _______
5. Do you know how to get to the horse range? ________
6. Have you ever gone in looking for wild horses? ________
7. Have you ever seen the wild horses? _______
8. How close did you get to the horses? ________

9. How close would you like to get to the horses?

10. How close would you expect to get to the horses?

11. What benefits did seeing the horses provide?

12. Would you like to see more information posted or provided about the horses? ______________

13. What type(s) of development would you like to see for the horse range? (check your preference(s))

____Pure preservation (no admittance)
____Primitive area designation (limited admittance)
____Hike-in viewing areas or blinds
____Jeep or off-road vehicle trails or tours
____Brochures & books on the horses
____Regulation of the herd to insure sightings
____Fencing some of the horses to insure sightings
____Gravel access roads
____High speed paved access roads
____Overlooks with viewing scopes
____Self-guided auto tours
____A large visitor or interpretive building
____Camping facilities

14. Do you think the horses are wild animals? ________

15. Which animal would you be the most excited to see (rank them from highest to lowest)?

________ Mule Deer
________ Golden Eagle
________ Coyote
________ Wild Horse
________ Great Blue Heron
________ Bighorn Sheep
________ Red Fox
________ Elk

16. What feelings do you associate with wild horses?

17. Do you ride often? ________
18. Do you own a horse? ________
19. Have you ever owned a horse? ________
20. About how far is your home from here?

________ 0-25 miles
________ 26-50 miles
________ 51-100 miles
________ 101-250 miles
________ 251-500 miles
________ 500 + miles

21. Which of the following best describes your home?

________ A large city > 500,000
________ A medium-sized city 100,000 to 500,000
________ A suburb of a large or medium-sized city
________ A small city 25,000-100,000
________ A town 5,000-25,000
________ A small town < 5,000
________ Rural area
________ Other

22. List your home town and state.

23. Will you come to this area again? ________ Why, or Why Not?

24. Date ________________ Type of party ________________

Location ________________ Equipment ________________

Number in party ________________

Sex(s) ________________

APPENDIX #3

COMPILATION OF QUESTIONNAIRES ADMINISTERED TO PARTIES TOURING THE PRYOR MOUNTAIN WILD HORSE RANGE (SUMMER 1975)

---

1. Have you been to Big Horn Recreation Area before?
   Yes 17 - Average number of times 1.5
   No 16

   Have you been to Pryor Mountain Horse Range before?
   Yes 4 - Average number of times 3
   No 29

   Have you been to Custer National Forest before?
   Yes 10 - Average number of times 3.2
   No 22

2. What is your major interest in coming here?

See wild horses	10
Just part of a tour	18
Plants and wildlife	2
Scenery	6
Just visiting	1

3. Why did you choose this area?

Wild horses	2
Exploring the area	3
With a group	13
Visiting in area	5
Diversity of area	2

4. Do you know about the Horse Range and herd?
   Yes 29
   No 3

5. Do you know how to get to the Horse Range?
   Yes 24
   No 9

6. Have you ever gone in looking for horses?
   Yes 5
   No 27

7. Have you ever seen the wild horses?
   Yes 17
   No 16

8. How close did you get to the horses?
   Average distance = 425 feet (very high standard deviation)

9. How close would you like to get?
   Average distance = 300 feet (very high standard deviation)

10. How close would you expect to get?

Average distance = 600 feet (very high standard deviation)

11. What benefits did seeing the horses provide?

None	2
Thrill of seeing them wild and free	8
Photographic value	2
Appreciation in knowing some are still left	2
Educational value	4

12. Would you like to see more information posted?

Yes	25
No	5

13. What alternatives for development of the Horse Range do you prefer?

Pure Preservation	2	Fencing the Herd	0
Primitive Area	14	Gravel Access Roads	5
Hike-in Viewing Areas	11	High Speed Paved Access Roads	2
Jeep Trails and Tours	14	Overlooks with Viewing Scopes	12
Brochures and Books	18	Self-Guided Auto Tours	4
Regulation of the Herd	2	Large Visitor or Interp. Center	0
		Camping Facilities	4

14. Do you think the horses are wild animals?

Yes	22
No	4

15. Which animal would you be most excited to see (rank one through eight)?

Mule Deer	Average = 6.04
Golden Eagle	Average = 3.08
Coyote	Average = 5.76
Wild Horse	Average = 3.21
Great Blue Heron	Average = 5.78
Bighorn Sheep	Average = 2.30
Red Fox	Average = 6.55
Elk	Average = 3.62

16. What feelings do you associate with wild horses?

None	2
Freedom	8
Wilderness associations	4
Spirit, beauty	4
Part of our heritage	7
Domestic animals	1
Numbers should be controlled	2
Leave them alone	2

17. Do you ride often?

Yes	9
No	23

18. Do you own a horse?

Yes	5
No	28

19. Have you ever owned a horse?

Yes	19
No	11

20. How far is your home from here?

0-25 miles	3
26-50 miles	4
51-100 miles	1
101-250 miles	1
250-500 miles	5
>500 miles	18

21. Which best describes your home?

Large City >,500,000	1
Med. City 100,000-500,000	2
Suburb of a Large or Med sized city	0
Small City 25,000-100,000	5
Town 5,000-25,000	7
Small Town <5,000	12
Rural Area	5
Other	1

22. Hometown and State

Wyoming	
Lovell	3
Powell	4
Worland	1
Casper	2
Lander	2
South Dakota	
Rapid City	11
Michigan	
Pontiac	2
New York	1
Illinois	4
Virginia	2
Georgia	1

23. Will you come to this area again?

Yes	20
No	1

APPENDIX #4

COMPILATION OF QUESTIONNAIRES ADMINISTERED TO PARTIES USING BIGHORN NATIONAL RECREATION AREA (SUMMER 1975)

---

1. Have you been to Bighorn Recreation Area before?
   Yes 84 - Average number of times 6.7
   No 16

   Have you been to Pryor Mountain Horse Range before?
   Yes 54 - Average number of times 3.9
   No 47

   Have you been to Custer National Forest before?
   Yes 51 - Average number of times 3.3
   No 50

2. What is your major interest in coming here?

Sightseeing	24
Swimming	15
Water skiing	6
Fishing	28
Boating	23
Passing through area	15
Visiting relatives in area	15
Camping	5
Caving	2
See wild horses	2
Riding	1
Backpacking	1

3. Why did you choose this area?

Good scenery	5
Near home	51
Like the lake, good fishing	38
New area to try	5
Passing through	7
Primitive area	3

4. Do you know about the Horse Range and herd?
   Yes 72
   No 25

5. Do you know how to get to the Horse Range?
   Yes 50
   No 46

6. Have you ever gone in looking for horses?
   Yes 32
   No 64

7. Have you ever seen the wild horses?
Yes 61
No 35

8. How close did you get to the horses?
Average distance = 450 feet (very high standard deviation)

9. How close would you like to get?
Average distance = 305 feet (very high standard deviation)

10. How close would you expect to get?
Average distance = 380 feet (very high standard deviation_

11. What benefits did seeing the horses provide?
None 17
Thrill of seeing them wild and free 23
Association with a part of America's heritage 15
A novelty with tourist and recreational value 12
Appreciation in knowing some are still left 4
Educational value 7

12. Would you like to see more information posted?
Yes 61
No 32

13. What alternatives for development of the Horse Range do you prefer?

Pure Preservation	7	Fencing of the Herd	7
Primitive Area	31	Gravel Access Roads	12
Hike-in Viewing Area	38	High Speed Paved Access Roads	7
Jeep Trails and Tours	43	Overlooks with Viewing Scopes	46
Brochures and Books	43	Self-Guided Auto Tours	16
Regulation of the Herd	17	Large Visitor or Interp. Center	13
		Camping Facilities	26

14. Do you think the horses are wild animals?
Yes 66
No 28

15. Which animal would you be most excited to see (rank one through eight)?

Mule Deer	Average = 5.09
Golden Eagle	Average = 3.77
Coyote	Average = 5.42
Wild Horse	Average = 4.07
Great Blue Heron	Average = 6.00
Bighorn Sheep	Average = 2.05
Red Fox	Average = 5.80
Elk	Average = 3.35

16. What feelings do you associate with wild horses?

None	13	Domestic animals	8
Freedom	34	Wilderness associations	8
Spirit, beauty, majesty	17	Leave them alone	13
Part of our heritage	19	Pryor Mountain Horse Range controversy	7

17. Do you ride often?

Yes	33
No	67

18. Do you own a horse?

Yes	30
No	71

19. Have you ever owned a horse?

Yes	60
No	37

20. How far is your home from here?

0-25 miles	26
26-50 miles	19
51-100 miles	26
101-250 miles	2
250-500 miles	3
>500 miles	25

21. Which best describes your home?

Large City >500,000	6
Med. City 100,000-500,000	5
Suburb of a large or med. sized city	1
Small City 25,000-100,000	17
Town 5,000-25,000	12
Small Town <5,000	55
Rural Area	5
Other	0

22. Home Town and State

Wyoming

Lovell	22
Powell	20
Greybull	4

Cowley, Gillette @ 2

Byron, Cody, Ralston, Worland @ 1

Montana

Billings	13
Bridger	2

Hardin, Earwax, Sidney, Edgar, Warren, Bozeman, Fromberg @ 1

Utah	1
Wisconsin	1
Washington	2
Colorado	1
California	1
Indiana	1
Illinois	4
Massachusetts	1
Michigan	3
Minnesota	2
Oklahoma	2
New Jersey	1
New York	1
Nebraska	3
South Dakota	1
Canada	1
West Germany	1

23. Will you come to this area again?

Yes	93
No	3

24. Type of Party

Day Use 78

Overnight 18

Equipment

Passenger Car	46	Boat	30
2-Wheel Drive Truck	24	Camper	20
4-Wheel Drive Vehicle	9	Motorcycles	4

APPENDIX #5

COMPILATION OF QUESTIONNAIRES ADMINISTERED TO PARTIES USING THE PRYOR MOUNTAIN SECTION OF CUSTER NATIONAL FOREST (SUMMER 1975)

---

1. Have you been to Bighorn Recreation Area before?
Yes 148 - Average number of times 7.6
No 67

Have you been to Pryor Mountain Horse Range before?
Yes 85 - Average number of times 5.9
No 130

Have you been to Custer National Forest before?
Yes 165 - Average number of times 9.1
No 51

2. What is your major interest in coming here?

Scenery	62	Camping	16
Big Ice Cave	81	Picnics	20
Get out	37	Hiking, backpacking	5
Peace and quiet	10	Motorcycling	4
Fishing	32	Wildlife viewing	3
Rockhounding	12	Viewing wild horses	6

3. Why did you choose this area?

Close to home	80	Good campground	7
New area to try	28	Rockhounding	3
No people	22	To see horses	3
To see Ice Cave	60		
Nice scenery	21		
Good fishing	9		

4. Do you know about the Horse Range and herd?
Yes 189
No 28

5. Do you know how to get to the Horse Range?
Yes 93
No 123

6. Have you ever gone in looking for horses?
Yes 47
No 171

7. Have you ever seen the wild horses?
Yes 90
No 127

8. How close did you get to the horses?
Average distance = 632 feet (very high standard deviation)

9. How close would you like to get?
Average distance = 612 feet (very high standard deviation)

10. How close would you expect to get?
Average distance = 1301 feet (very high standard deviation)

11. What benefits did seeing the horses provide?

None	20
Thrill of seeing them as wild animals	30
Seeing part of America's heritage	15
Just to say I saw one	27
Just knowing that they are there	20
A novelty with tourist and recreational value	6
Educational value	11
Seeing a part of nature	12
Photographic resource	3

12. Would you like to see more information posted?

Yes	147
No	58

13. What alternatives for development of the Horse Range do you prefer?

Pure Preservation	15	Fencing the Herd	7
Primitive Area	101	Gravel Access Roads	46
Hike-in Viewing Areas	88	High Speed Paved Access Roads	5
Jeep Trails and Tours	63	Overlooks With Viewing Scopes	83
Brochures and Books	83	Self-Guided Auto Tours	23
Regulation of the Herd	34	Large Visitor or Interp. Center	17
		Camping Facilities	59

14. Do you think the horses are wild animals?

Yes	141
No	62

15. Which animal would you be most excited to see (rank one through eight)?
Mule Deer Average = 5.04
Golden Eagle Average = 3.66
Coyote Average = 6.18
Wild Horse Average = 3.90
Great Blue Heron Average = 5.88
Bighorn Sheep Average = 2.32
Red Fox Average = 5.56
Elk Average = 3.17

16. What feelings do you associate with wild horses?

None	13	Domestic animals	17
Part of our heritage	24	Part of nature	7
Freedom	64	Wilderness associations	4
Spirit, beauty, majesty	17	Pryor Mountain Horse Range controversy	6
Preserve them as a wild animal	33		

17. Do you ride often?

Yes	52
No	168

18. Do you own a horse?

Yes	55
No	153

19. Have you ever owned a horse?

Yes	101
No	104

20. How far is your home from here?

0-25 miles	8
26-50 miles	42
51-100 miles	130
101-250 miles	10
250-500 miles	3
>500 miles	22

21. Which best describes your home?

Large city >500,000	3
Med. city 100,000-500,000	11
Suburb of a large or med city	6
Small city 25,000-100,000	106
Town 5,000-25,000	11
Small town <5,000	42
Rural area	33
Other	1

22. Home town and state

Montana

Billings	109
Bridger	10
Fromberg	8
Laurel	7
Pryor	6
Crow Reservation	4
Red Lodge, Joliet @	3
Warren, Hardin, Broadview @	2

Butte, Sidney, Shepherd, Miles City, Huntley, Malta, Ft. Smith, Great Falls, Lockwood, Belfry, Lloyd, Sandstone @ 1

Wyoming

Powell	8
Lovell	4
Frannie, Cowley, Shoshoni @	2
Clark, Worland @	1

Alaska	1
Arizona	1
Colorado	2
Indiana	1
Illinois	1
Kansas	2
Florida	1
North Dakota	2
Oklahoma	1
Ohio	1
Utah	1
Maryland	2
Minnesota	1
Michigan	3
Missouri	5

23. Will you come to this area again?

Yes	212
No	5

24. Type of party

Day Use	188
Overnight	27

Equipment

Passenger Car	90	Camper	17
2 Wheel Drive Truck	29	Trailer	8
4 Wheel Drive Vehicle	64	Motorcycles	11
Van	8		

This intern report was read and accepted by a staff member at:

Agency: Bureau of Land Management-- Montana State Office
Address: P.O. Box 2020 Billings, Montana 59103

This report was completed by a WICHE intern. This intern's project was part of the Resources Development Internship Program administered by the Western Interstate Commission for Higher Education (WICHE).

The purpose of the internship program is to bring organizations involved in community and economic development, environmental problems and the humanities together with institutions of higher education and their students in the West for the benefit of all.

For these organizations, the intern program provides the problem-solving talents of student manpower while making the resources of universities and colleges more available. For institutions of higher education, the program provides relevant field education for their students while building their capacity for problem-solving.

WICHE is an organization in the West uniquely suited for sponsoring such a program. It is an interstate agency formed by the thirteen western states for the specific purpose of relating the resources of higher education to the needs of western citizens. WICHE has been concerned with a broad range of community needs in the West for some time, insofar as they bear directly on the well-being of western peoples and the future of higher education in the West. WICHE feels that the internship program is one method for meeting its obligations within the thirteen western states. In its efforts to achieve these objectives, WICHE appreciates having received the generous support and assistance of the Economic Development Administration; the Jessie Smith Noyes Foundation; the National Endowment for the Humanities; the Wyoming Office of Manpower Planning; and of innumerable local leaders and community organizations, including the agency that sponsored this intern project.

3677-38214510000045700:
1C:975:WICHE:2H243

For further information, write Bob Hullinghorst, Director, Resources Development Internship Program, WICHE, P.O. Drawer 'P', Boulder, Colorado 80302 or call (303) 492-7177.